Mac in the bootLab? Apple G3 rated against P-II power

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K6 3D

AMD injects 3D power into its new low-cost CPU. Head-to-head benchmarks prove Intel should be scared

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NEW PRODUCTS REVIEWED

INCLUDING:

400MHz Systems from Dell and Gateway

&

A Trio of Voodoo^2-Based 3D Cards

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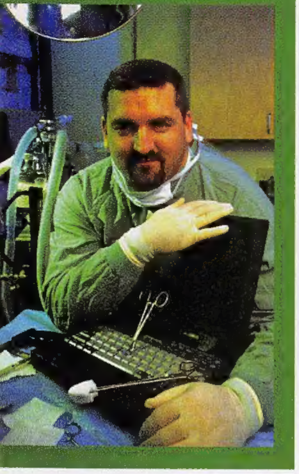

The Bernoulli Principle

This isn't the last EdWord. Not by a longshot.

In fact, as long as there are incredible technologies emerging and big companies to piss off, there will be plenty more to come. It just won't be under the infamous *boot* banner. Going forward with the September issue, I'll be leading the entire motley *boot* crew in our biggest adventure yet: *Maximum PC.*

Now don't freak out. Sometimes change is a good thing and this is one of those times.

Maximum PC will enable us to deliver exactly what the *boot* reader has always demanded: More. More news, more reviews, more previews, more step-by-step how-to guides, more of everything you love in *boot.* Plus brand new sections are being added to the mix, such as a monthly department geared to protect you from companies trying to shaft you and a running lexicon of the more esoteric tech terms littered throughout the magazine.

Does the name change mean we're selling out? Hell no. We'll still be the same bunch of roughnecks you've come to know and either love or hate, and we'll still be dedicated to calling 'em like we see 'em.

So, are we going to miss *boot*? Yes. We accomplished a lot behind that banner and we're all proud of what that name has come to stand for (and who knows? Maybe the *boot* brand will resurface...). But ultimately the name "boot" is just a word. What made *boot* special were the editors and artists who gave it their all, the ad and business people who knew well enough to give us that freedom, and most importantly you, the readers.

Every month, I personally read every one of the thousands of letters y'all send in. While I may not have time to answer each and every one (although we try to answer as many as possible), these letters are the blueprints for the magazine. Reading all these letters, I get a clear picture of what your wants and needs are, and that vision is what's going to guide *Maximum PC* as well.

So, for the next 60 days, I want you to hold tight while we crank up the volume on *Maximum PC.* It'll be worth the wait!

Eadem mutata resurgo,

Brad "Big Daddy" Dosland
Editor in Chief

GrabIt Pro, pg 70

NEWS

16 bootWire *News that **matters**. Blizzard Entertainment is hit with an **avalanche of criticism** for using its software as a backdoor to ransack gamers' hard drives... **Fake Pentium IIs** surface on three continents. Is your CPU an overclocked phony?... S3 pimps its **new 3D chipset** at the Computer Game Developer's Conference.*

VOICES

4 Comm Port *The **bootPolitic** sends us letters. We run 'em.*

23 The Saint ***Alex St. John** castigates Intel for pushing processors that give software developers a green light to be lazy.*

25 Game Theory ***T. Liam McDonald** trains his sights on critics who blame computer games for **juvenile violence**. Heads will get flown.*

27 On the Line ***Shel Kimen** drops radical beat poetry on **paternalistic Yankees** who try to claim the Internet as a U.S. protectorate.*

29 Fast Forward ***Tom Halfhill** says he doesn't need a **$5,000 Dream Machine** to fulfill all his computing needs.*

96 Glitch *Praise be! A new butterMark record! **Jebediah Phillips** reviews the most **AmishWorthy** butterchurn this side of Lancaster, PA.*

THE TECH FILES

56 White Paper *Every hardware device you ever installed is hiding its dirty little secrets in **your Registry**. Here's how it all works.*

58 Clinic *Jimmy had a **computer problem**. Jimmy went to the bootClinic for **advice**. Jimmy's all better now.*

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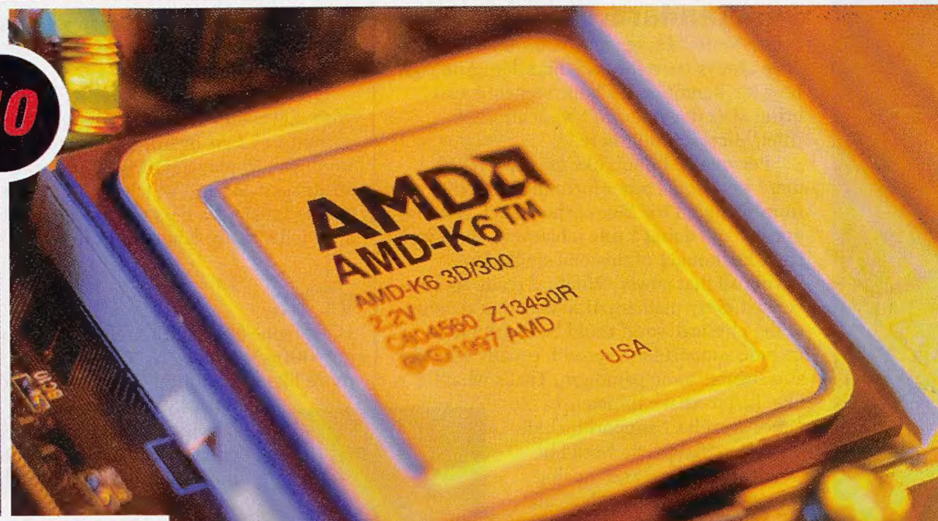
20 Pure Lust ***High-tech toys** for all-digital girls and boys.*

61 Reviews *The **sexiest computer parts** in the universe hot-strut across the stage for the judges' scores:*
*- **Apple's G3** is a graphic designer's dream.*
*- ATTO's Solid State **hard drive** is actually just one gig of superfast SDRAM.*
*- There's nothing mysterious about the **Alienware Area 51**'s awesome performance.*

Alienware Area 51, pg 74



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The 3D CPU

AMD's new **K6-2** processor is **fuel-injected** with 21 instructions to race through 3D code. Find out where it **works** and where it **doesn't**, and why **Intel** must play catch-up in the **New Polygon Order**.

32

Lip: Linux Manifesto

Forget Bill Gates and his blue screen of death. **Linus Torvalds** and Linux—his OS for the masses—is vying for the worldwide throne. His manifesto is clear: Your OS must be trustworthy, secure, and dependable. But can Torvalds destroy the Gates regime and win the war?

Special Sneak Preview from the Editors of boot Magazine

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Maximum PC Preview

Be the **first** to check out our exclusive preview of the ultimate magazine for PC owners... **Maximum PC**.

We've got first pages from this work-in-progress and answers to all your questions in our **FAQ**.

Cover Photography by Aaron Lauer

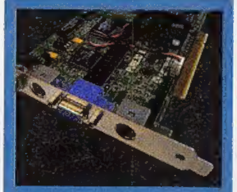
COMM PORT

Substandard Living

A bootNet reader recently commented online: "I've always been for the underdog, And right now it's Rendition... I hope someone can bring 3Dfx down. I don't want another Intel/Microsoft out there."

Personally, I don't like gravity—I wish there were some other force that kept me from flying off the face of the planet. Not that gravity isn't doing a fine job as it is, but I just hate the thought of this one single force having all that power. What I'd really appreciate is if every mathematical equation relating to the physical world could be rewritten to include support for a second, equally effective and cumbersome paradigm. That's what I'd like. Just to shake things up a bit. Other agendas I support include one where flatulence would be considered a deep and moving soliloquy, and another that calls for an additional monetary equivalent to the quarter, such new coin being dubbed "the fourth," which would be interchangeable in all applications where quarters might normally be used... should the open market embrace and support it.

Robb King



"I thought Voodoo^2 would get 100fps in Quake II. ***No way!****"*

Quick! Someone Call A Parametric!

When will the 3D game industry move beyond the traditional polygon-based modeling/rendering to more advanced techniques, such as parametric surface patches, that can shed the blocky look prevalent in today's games.

Dave

Senior Editor Andrew Sanchez replies: *All the major game development houses should start dabbling in more esoteric modeling techniques, such as NURBS, splines, and even parametric surface patches by Q4 of this year—if you're lucky. Shiny's* Messiah *is going to use realtime deformation and tesselation. But we don't expect these new techniques to occur in realtime first-person shooters for at least a year.*

Crying Old Man

I'm writing in response to Alex St. John's article "When Superior Technology Dies" in *boot* 22. I must say it almost brought tears to my eyes. I was also once a Commodore geek, and I can truly say that those were the best computing years of my life. Never had I enjoyed getting together with a bunch of friends and blowing off a Saturday night playing with our C-64s.

It was so much simpler then. We didn't worry about IRQ conflicts or comm port settings or port addresses for our hardware. Need another floppy drive? Just plug it in. Want a printer? Just buy it, bring it home, take it out of the box, plug it in, and print. These days, you're lucky to be able to install the drivers correctly and be able to print within five hours.

I remember playing Origin's *Ultima IV* on my C-64. It was the most enjoyable game I've ever played.

I now have a P-II 300MHz, loaded with a Monster II and all the goodies, and sometimes I sit in front of it and just have no desire to play anything. I just end up shutting it off and watching TV. Your article touched a nerve with me and I am sure with many other "old timers."

Kevin

V^2 BS

Is everyone blind? I thought Voodoo^2 would get 100fps in *Quake II*. No way! 60fps is more like it. I admit it does pretty good in 640x480 (100fps = pretty good) in what I consider to be easy games like *Forsaken*, but SLI mode doesn't add more than a frame or two at 640x480. The only thing SLI is good for is 800x600 and above.

And what good is it in a stock Pentium? My Thriller 3D does just as much.

LorDDanE

Senior Editor Andrew Sanchez replies: *You hit the nail on the head, buddy. Voodoo^2 is specifically engineered for the fastest CPU money can buy. It is not designed for Pentiums—it's engineered for Pentium II/K6 2 running in excess of 266MHz for maximum polygon pleasure. For stock Pentiums (i.e. 200MHz and below), classic Voodoo or your Thriller 3D is a better solution.*

But then again, if you don't plan on doing the CPU upgrade, your current set up is just fine—I guess you'll never experience the thrill of 1024x768 Quake *on a K6 2 running at 60fps.*

Posthumous Ass Kicking

In *boot* 19, the Hercules Thriller 3D (PCI) received an 8 and no Kick Ass. In *boot* 20 the Real 3D StarFighter (AGP) received a 9 and a Kick Ass. In *boot* 21 the Creative Labs' Voodoo^2 received a 9 and a Kick Ass. But in your Triathlon article (*boot* 22), the Hercules Thriller 3D tied the Voodoo^2 overall and beat the Real 3D StarFighter.

To save yourself in my eyes, give the Thriller 3D the Kick Ass it so plainly deserves.

Road Dog

Senior Editor Andrew Sanchez replies: *The Hercules Thriller 3D is a good 3D accelerator hindered by really crappy TV-output. We've said it before, and we'll say it again—if you're gonna do something on a videocard, either do it right, or don't do it at all.*

The Brooktree TV encoder used by the first batch of 8MB Thriller 3D sucked. But, we've heard Hercules plans on replacing that part with the much-superior Chrontel chip (the same ASIC vendor that supplies the TV power of the most-excellent Canopus Pure 3D II reviewed on page

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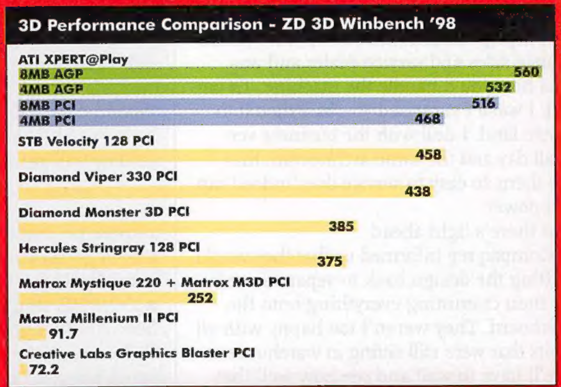

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84). So, if they indeed go that route, that could very well bring the board's score up in our mind. If the 8MB board had shipped without the TV output, we probably would've given it the nod for a Kick-Ass award.

FPU On A Stick

I'm constantly reading about how one CPU is better for certain games because of the better floating-point unit. So why doesn't some manufacturer develop a PCI card with a powerful FPU for 3D games? This would be similar to when you needed a math coprocessor in the 386 and early 486 days. We already have specialized processors for graphics, sound, modem communications, etc. Why not one more to crowd our cases and add some real power at the same time? I own an AMD K6 233 and would be willing to pay to extend the life of my CPU.

Tim McCormick

Senior Editor Andrew Sanchez replies: *Funny you should mention that—Rendition plans on doing just that with its 3D Conspiracy architecture, which will combine Fujitsu's Pinolite 3D geometry accelerator with its V2x00 family of accelerators, specifically for folks such as yourself who want to squeeze that extra mileage out of systems that may be a bit floating-point impotent. Other vendors are rumored to be considering doing something similar, but the only problem with adding more silicon to your videocard is that you drive up the final cost of the product. With AMD's K6 2 technology opening the FPU bottleneck on the front end of the 3D pipeline (something a dedicated 3D geometry processor does), it may be a shrinking market.*

More Sugar In My Gas Tank!

I was tearing through *boot* 21 when I ran into your Compaq Presario 4880 review. I work for a Compaq sales and service dealer and was curious how you'd handle the machine. To be honest, I wasn't surprised you banished it to mediocre land. I deal with the business versions all day and the same architecture that makes them so easy to service does indeed sap a lot of power.

But there's light ahead.

A Compaq rep informed us that they would be shifting the design back to separate cards rather then cramming everything onto the motherboard. They weren't too happy with all the units that were still sitting in warehouses.

We'll have to wait and see how well they implement the shift. Hopefully, it'll get granny out of the driver's seat and back into the home where she belongs!

Gord Armstrong

News Editor Bryan Del Rizzo replies: *If you haven't already done so, check out our review of Compaq's new Presario 5630 in boot 22. It's as if Compaq looked at every complaint we ever lobbed at the older models and made sure to correct it. The 5630 is the epitome of kick-ass: lots of cool features, kicking performance, and pro-active engineering. It even includes front-mounted USB and 1394 ports, and a dedicated Digital Flat Panel interface. If the Presario 5630 is any indication, Compaq appears poised to hold on to that number-one spot.*

Intel-ligence Report

Intel's move into 3D with its own chip was just the opening salvo. Why would it release a 64-bit solution when nVidia is showing the future with 128 bits? Intel was committed with its two partner companies to produce this chip because it was a way to gain "intelligence" behind a legitimate market entry—not a whole-hearted effort.

The cards with the Intel3D solution will sell well—so I don't see them as a real money loser—but I don't think that was the true aim.

What happened when Intel entered the core-logic chipset market? They got their feet wet first—then muscled their way to the top of the mountain. And that is what I see going on here. I'll bet a buck that Microsoft has its little fingers in here somewhere.

Suppose some big company (or two) gains a big piece—or all—of nVidia, then uses its deep corporate pockets to go after the real enemy: 3Dfx and—gasp—id. Why them? Well, who broke ranks with the Microsoft gospel of D3D and DirectX? Who sees OpenGL and Glide as an alternative API that frees them from Microsoft's dictates about the future of D3D and 3D? How many games are going over to the OpenGL and Glide camps? It's a revolution in the making, and Intel and Microsoft will allow no brushfires in their backyards they don't light themselves.

nVidia's problem is that it has something that someone very big wants. The Big Boys are flexing corporate muscle and the little guys had better think fast or they will get swallowed.

Vern Earlywine

Microsoft
Intel

"It's a revolution in the making and Intel and Microsoft will allow no **brushfires in their backyards** they don't light themselves."

I know processor technology has to go forward, but this is ridiculous. Intel's never made a 100MHZ leap this quickly before. I just got a 300MHz P-II a month ago, and Intel just came out with a 400MHz part; 333 OK, 350 fine, but 400? There was no reason for that. 400s weren't supposed to be out for a couple of months now!

Raptor6001

I'm so sick of Intel. Not the products, but the marketing they use for them. For instance, with the new P-II processors they say you can now see and use "3D," and run "powerful business applications" if you have a new P-II processor, especially with the new 100MHz bus, 440BX chipset, AGP, and the 400MHz P-II.

You idiots know that the only thing you want to do is play games, so stop hiding the truth. Lets face it, games and huge network servers with a need for a lot of processing power are just about the only things that need a 400MHz P-II. (But hey, I don't care, keep crankin' 'em out. I'm buying the 500MHz as soon as it hits the shelf, and do you know what for? Games!)

In the Lip interview in *boot* 21, Intel states the i740 has become the standard for a 3D graphics.

I have only seen two cards featuring the i740, a generic brand, and the Real 3D StarFighter, both of which have just recently been introduced. I fail to see how the i740 became the standard overnight, or in a matter of just two-and-a-half weeks.

Intel truly nailed themselves to the wall all by themselves without the editors having to nail them.

Big Woogie

I read your interview with Intel in *boot* 21, concerning its upcoming i740 3D chipset, and I thought the arrogance was unbelievable.

But then came your article right after, in which you reviewed all the new 3D chipsets, and Voodoo^2 and V2200 both kicked Intel's ass. That's what I love about you guys. You let Intel spew marketing drivel without any concern for reality, and then you present verifiable, reproducible, and comparable facts and statistics so your readers can make informed purchasing decisions.

I work for a major computer-products vendor and track the stats. Voodoo and Voodoo^2 chipset cards outsell anything else by a long shot. And as long as you're there to help customers cut through the hype and buy the best products available, I'm sure they always will.

Mark

I can't believe you didn't ask the Intel video gurus specifically what they thought about AMD adding Direct3D into their chips (à la the K6+3D). You just hedged around and didn't make 'em squirm! I would've loved to hear their response.

Timothy Ked

News Editor Bryan Del Rizzo replies: *Actually, we ask tons of questions that don't appear in the final interview (usually because the subjects refuse to give us a straight answer), and we did ask Intel about the K6 3D (now called the K6 2). However, they claimed they "didn't know much about it," and said "they weren't close enough with the product to be able to comment." Unfortunately, more prodding didn't result in anything worth printing.*

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Cost-Efficient Game Engines

I'm interested in getting into game development, but have yet to find a suitable source for a proprietary game engine. I'm using Kinetix's *3D Studio Max R2* and Adobe *Photoshop* for all of the rendering. All the engines I've come across so far are based on for-end-sale use and are quite costly. I'm not interested in selling the end games, so what is an aspiring game developer to do?

Chris Parker

Columnist Alex St. John replies: *I'll assume you're looking for a 3D engine such as* Quake *here. There are three good sources. First, id (www.idsoftware.com) publishes the source code for all of its older game engines. You won't be getting* Quake III *code, or much support, but it's a good starting point. There are two other companies I'm aware of who are, or will be, releasing 3D engine developer kits to the masses. First is Eclipse, at www.eclipsegames.com, and second is Monolith, at www.lith.com. Both companies have state-of-the-art 3D engine technology that they will be giving to developers. I believe they both will subscribe to the "give-it-away free" approach, but expect some sort of licensing fee if you actually publish a real title.*

> "I understand all this **hate mail** that Microsoft has been getting, but I've had enough of the complaining, bitching, and moaning about the same old thing."

3D Games Deserve 3D Sound

With the onslaught of 3D video hardware, where is the 3D sound? And not some lame excuse that uses matrix channels, such as Dolby Pro-Logic (DPL). I want 5.1 discreet channels of mind-blowing sound. Movies have had it for years, why not video games? I know some coin-op arcade games, such as Atari's Rush, have used multiple channels of discreet digital audio. So where's the port for PC? I don't expect manufacturers to include a Dolby Digital (DD) or DTS processor on their sound card, but a Dolby Digital output would be nice. Then I could hook my computer up to my Denon DD THX receiver and play games the way they were meant to be played!

Now PCs have DVD. So what? They don't have digital audio outputs! I see all these ads for computers that have DVD touting DD 3D sound, and all you're really getting is a two-channel matrix mix down of the 5.1 channels.

Please, tell me I'm wrong and that there is a card out there that has a DD output. Even if it is a combo MPEG-2 video decoder with DD output, I can live with that. I know a lot is going on with computer audio right now, such as the new features in the coming DirectX6, that will make gaming even better, but I want games that have sound that will induce epileptic seizures!

J. Crews

Webmaster Daevid Vincent replies: *Whoa there, fireball. This time last year, you'd be hard-pressed to find a real 3D soundcard, and now, most of the ones we see have that taken for granted. You have to allow time for the industry to catch up. Surround sound in games will be coming along shortly, and DVD is the catalyst for that to happen. You have to remember, the market is driven by demand (and technology to a certain extent). A year ago, we were just seeing Pentium IIs, and now it's practically the norm. Besides, how many home users have THX or Surround 5.1 in their houses, much less connected to their PC. We hear tell that the SoundBlaster Live may have DD.*

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Dare To Compare

Please direct me to where I might find a graphical, side-by-side, comparison of the Intel, Cyrix, and AMD 200MHz processors with MMX. I need to see how they truly stacked up against each other.

Mark St.Pierre

Senior Editor Andrew Sanchez replies: *Zoinks! You mean a balls-nasty, hot CPU ménage-à-trois? Take a gander back at boot 12's cover story on the "Pentium Killers," where we did exactly that. We pitted Cyrix's 6x86-MX PR-200, AMD's K6 200, and Intel's Pentium 200MHz MMX CPU in a massive free-for-all. If you can't get a back issue, jump onto our website at www.bootnet.com/youaskedforit/pentiumkillers.html for an online version of the article.*

The Days Of Whine And OSes

BeOS has no games on it and barely any applications, and Be wants to charge $99 for it without even a free release first? Be gave away the first two releases on the Mac. There's no way anybody would want to buy it without testing it for free. I was ready to format my HD, instead I'm not doing it. Why did Be have to be so dumb? Now they won't have any support for it. They can go to hell for all I care!

vinny006

Make Mine Microsoft

I understand all this hate mail that Microsoft has been getting, but I for one have had enough of the complaining. These people complain, bitch, and moan about the same old thing. I understand that some people use Win95 for something other than playing games (God forbid), for something like, uh, working? I'm not one of these people.

I play games and go on the net for patches, demos, or the occasional frag. That is all I do, this is my hobby, and that's it. And I admire what Microsoft has done. Win95 has furthered my gaming experience and that's all I care about. Sure Win95 crashes, but are you telling me that DOS never did?

Now with 3D becoming the standard, that gaming experience has been furthered even more.

But now, when someone writes a crappy piece of code for a particular DirectX game, Microsoft takes heat because it's "Microsoft's fault" for inferior interface (or whatever). I am not against someone speaking out, but everything can't be Microsoft's fault.

The bottom line is: If you don't like Microsoft, don't use its software.

Pat Vachon

Beyond Thunderdome

What is coming after the 400MHz Pentium II, and when?

Roberto Zayas

Senior Editor Andrew Sanchez replies: *Oh Roberto, you're asking me to break a million Non-Disclosure Agreements! Do you really want Intel to summon its Ninja-Bunny Men to drop me like a bad habit? Ohhh, the horror! And to think I was going to do a massive 440BX motherboard roundup.... From what I've heard (and this is always subject to change), once Intel does the 400MHz Slot 1 thang, they plan on bumping that up to at least 450MHz. You'll be also seeing high-speed 400–450MHz Slot 2 Xeon CPUs around that time frame as well—this will be around the fall of 1998.*

In 1999, expect Merced and other Intel CPUs (currently going by code names such as Tanner) and new core-logic AGPsets to also come out.

Cross The PCI Bridge

Quantum3D says the Obsidian2 line of Voodoo^2 cards has a 66MHz PCI bridge chip, allowing the cards to download textures and polygons from the CPU at 66MHz, but a 33/66 PCI 2.1 system is required. Does that mean that any PCI 2.1-compliant motherboard will support this 66MHz speed, or is this for high-end motherboards or future designs? Also, if 66MHz PCI can be done, why would anyone make an AGP Voodoo^2 card, since Voodoo^2 only supports 1x AGP (i.e. 66MHz)?

Leroy Freeman

Senior Editor Andrew Sanchez replies: *Well, a little bird whispered in my ear that...*

1. *Yes. The 440BX will support both.*
2. *The first 500MHz CPU will most likely be a Katmai-based processor, and that will arrive in Slot 1.*
3. *Actually, after the 440BX, there'll be the 440GX AGPset, followed by the quad-CPU 450NX, and then there'll be others. In terms of actual specifications, we're still waiting on Intel to cough up the complete 411 on the next-generation chipsets—Dan Francisco, are you listening?!*

Mission: Improbable

I have a mission for the bootCrew. Find a Socket 7 motherboard with AGP, five PCI slots (or four with SCSI onboard), and at least 1MB cache, preferably 2MB. Also, if you can, find it in AT formfactor. That is all. This message will self-destruct in five seconds.

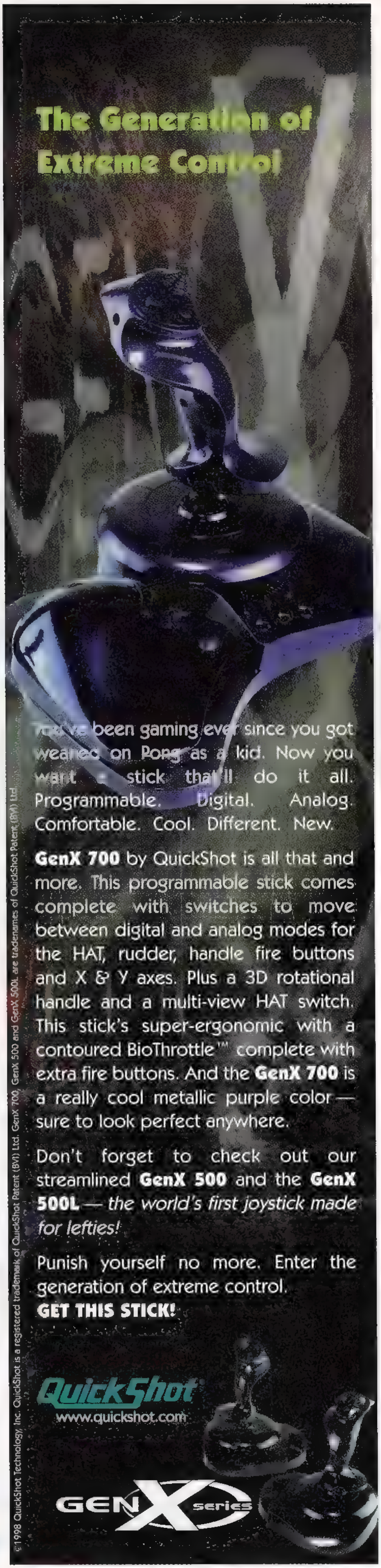
Steve Bottari

Senior Editor Andrew Sanchez replies: *Agent Bottari. The motherboard you're looking for is a phantasm—a figment of imagination brought on by fears of Slot 1.*

The most I've seen for AT/AGP Socket boards in terms of PCI slots are four, but I have yet to see onboard SCSI with any of these boards. Why? Most mainboard makers are aiming their Socket 7 AGP boards as low-priced/entry-level AGP solutions, and kewl features such as onboard SCSI are not a part of the gameplan.

Cut, Copy, Paste

In the *boot* 22 feature, "Utilities for the Damned," we gave incorrect contact information for *Drive Image 2.0*, from PowerQuest. PowerQuest can be reached at 800.379.2566 or www.powerquest.com. *Drive Image 2.0* costs $69.



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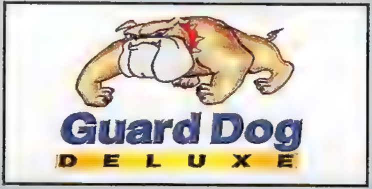

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COMPRESSION ENGINES' wavelet technology is capable of compressing full-screen true color images into a fraction of their original size. For example a 1MB image can be compressed to 8K or less.

CYBERIMPACT

CYBERNET Systems Corp.'s **CYBERIMPACT SDK** is the most advanced force-feedback development environment available. Its advanced features and device independence make it the standard for integrating force feedback into entertainment and virtual-reality applications.

M@X, from Aims Lab, makes video e-mail smaller than byte size. *M@X* allows the video-equipped PC user to e-mail as much as a minute's worth of video in less than a minute, ending the long upload and download delays currently inherent in even the most state-of-the art modems.

HoTMetaL PRO 4.0

HOTMETAL PRO 4.0 is a web development solution for authoring and publishing web sites. It provides tools to easily develop dynamic sites that feature the latest web enhancements such as DHTML, CSS, and Java applets. Developers can seamlessly switch between three authoring environments—WYSIWYG, Tags-On, and Source Code—to efficiently create and refine pages.

Microsoft
DIRECTX

DIRECTX 5.2 allows games to bypass Windows 95 and talk directly to hardware such as your video and sound cards. It is required by a large number of games. New in release 5.2 is the Setup portion, which now does a better job of detecting cards. No new drivers have been added. If your DirectX 5 installation is working properly, you don't need to install.

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SOFTWARE DEMOS

Battle Arena Toshinden 2

BATTLE ARENA TOSHINDEN 2 takes place at an underworld martial arts tournament. Inside the ring, fighters can use any number of weapons, except firearms. The game, which has eleven characters to choose from, lets you play with a gamepad, keyboard, or joystick.

Jane's
COMBAT SIMULATIONS
F-15

JANE'S F-15 combat sim will have you up and flying in five minutes. The engine technology includes true lighting and shadows, night vision, tracer fire, dissipating smoke trails, and translucent clouds. Other features include mid-air refueling, smart bomb camera views, and more than 30 weapons to fire.

LAST BRONX comes with eight distinct street fighters and eight fighting locations (including actual scenery from Tokyo). The game supports head-to-head network play over LAN, modem, and serial link, and is optimized for Pentium and Pentium with MMX technology.

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Each month, the *bootDisc* is stuffed with game demos, application demos, utilities, and patches—so don't miss this treasure trove of valuable software.

BATTLE ZONE

BATTLEZONE, a contemporary remake of the popular 80s war simulation, lets you pilot an anti-gravity tank loaded with weapons of mass destruction, command more than 30 troops, construct bases, deploy forces, manage resources, and build up your empire. Supports D3D, multiplayer, or death match over LAN, modem, or Internet.

DIE BY THE SWORD

In **DIE BY THE SWORD**, you're a sword swingin' knight who has to slice, dice, and maul your way through a cavernous mountain stronghold to rescue your true love from ritual sacrifice. The game includes seven distinct environments, proprietary VSIM motion technology for unlimited freedom of movement, and full multiplayer support.

eMedia
GUITAR
METHOD
The Easiest Way to Learn Guitar.

EMEDIA GUITAR METHOD, touted as the easiest way to learn guitar, is a tutorial package with 60 comprehensive lessons ranging from basics such as holding and stringing the guitar to playing chords, melodies, and finger picking. Styles covered include rock, blues, folk, and classical.

FORSAKEN Beautiful texture maps, silky smooth frame rates, and delectable colored lighting are just a few of the awesome features you'll find in Acclaim's 360 degree 1st person shooter, *Forsaken*. Supports Direct3D and multiplayer combat over network, Internet, modem, or serial connection.

GRAND THEFT AUTO

GRAND THEFT AUTO is a morally bankrupt game that lets you car jack innocent motorists, shoot police officers, and run over pedestrians. While the missions are well designed, one of the game's strengths is the opportunity to just ignore your goals altogether and become a menace to society.

INCUBATION

INCUBATION: THE WILDERNESS MISSIONS contains more than 50 missions. The story picks up with you returning to Scayra to retrieve precious raw material left behind during the last mission. This time you'll find yourself wandering around a mysterious jungle. What you discover there will push your tactical skills to the limit.

Opera
software

OPERA, weighing in at a little more than a megabyte, is the newest Internet browser to compete against *Navigator* and *Internet Explorer*. An image-loading toggle at the bottom of the screen turns graphics loading on and off, and pages can be resized from 20% to 1,000% instantly.

SANITARIUM

SANITARIUM is a journey through the depths of one man's consciousness to confront the demons from his past and escape the imprisonment of his mind. Interact with over 80 characters, uncover conspiracies, and journey through Sanitarium's nine episodes. Features photo-realistic full-screen cinematics.

STARSIEGE
UNIVERSE
www.starsiege.com

STARSIEGE is a 3D combat sim using a proprietary engine that gives users a seamless interior/exterior world and a multiuser environment. Things to look out for are the ability to create your own server, join existing *Starsiege* clans online, and immerse yourself in a 3D combat world.

EAD
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"I kick tush in PC games.

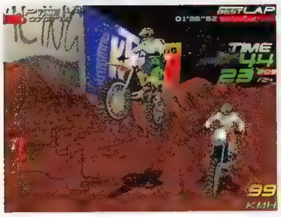
INTENSE 3D Voodoo
6MB 2D/3D GRAPHICS ACCELERATOR
INTERGRAPH

I used to rap your knuckles twice a week for not doing your homework. Now I'm going to kick your tush in a fast-paced action-packed game of Moto Racer. And I can do it, too, because I've been playing with an **Intense 3D Voodoo PC graphics card**. Based on the **3Dfx® Voodoo Rush technology**, Intense 3D Voodoo's **realistic 3D graphics** gives me the edge to hone my playing skills. And its **TV-out connecter** lets me plug my PC into the big-screen television in the rectory, so I really get into the action. Plus, because Intense 3D Voodoo **runs regular Windows 95 applications**, I still manage to track the school finances and bake sales and keep up my correspondence with Father Flanagan."

Get the card that's given Sister Mary Margaret the edge. Get Intense 3D Voodoo, now. Available at retailers nationwide.

INTENSE 3D Voodoo

Sister Mary Margaret, Moto Racer devotee, says "Get Intense 3D Voodoo, or suffer the wrath!"



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Computer Game Developer's Conference

A Special *boot* Report

This year's Computer Game Developer's Conference—which has dropped the word "computer" from its title so it can now invite the console crowd (completely destroying the conference's original intent)—was uneventful as far as new products were concerned. Still while most vendors appeared to be hedging their bets on E3, we were still able to uncover a few surprises on the show floor.

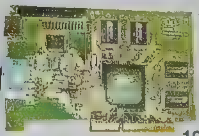
In the archaic arcade, gamers from around the country crowded around Tron, Pac-Man, *and* Pong.

3D Update

Love 'em or hate 'em, S3 appears to be on the brink of a major comeback with its new 128-bit Savage3D chip. At the show, S3 had the Savage3D running against 3Dfx's Voodoo^2 using an Internet version of *Turok Dinosaur Hunter* as a benchmark. The test bed consisted of identical systems with 400MHz Pentium IIs and 64MB of RAM. The result? The Savage3D clocked in at 54.1fps, almost ten frames faster than the Voodoo^2. For the record, S3 also compared its card to Intel's i740 (at 29fps) and nVidia's Riva 128 (at 36.6fps). Frame rates aside, the picture quality we witnessed was better than other chips as well.

Quake II *as rendered by S3's new chip.*

Over at 3Dfx, we learned a few things about Banshee, which 3Dfx claims is not intended to be a Voodoo^2 killer. Banshee, which will be fully Voodoo compatible, will have as much horsepower as the Voodoo^2, but will not supplant the Voodoo^2 SLI. Banshee is based on single texelfx2 and pixelfx2 technology, meaning you'll take a performance hit on games that take advantage of multiple textures. However, Banshee brings strong 2D functionality, including support for up to 16MB SGRAM or SDRAM (depending on your budget), 128-bit VGA core, and 2x AGP, but no DME (direct execution of textures from memory). Other features include dynamic environment mapping (for things such as reflections of reflections), bump-mapping, full-speed trilinear mip-mapping, and full scene-edge anti-aliasing. The chip has also been optimized to recognize MPEG-2 hardware/software decoders and NTSC/PAL throughput. Though the numbers aren't final, Wayne Do, 3Dfx's product manager, said, "We can expect to see Banshee performing at 55.3fps on D3D-based games, and over 60fps on Glide-based games."



Banshee

Matrox showed its new MGA-G200 powered Marvel G200 (previewed in *boot* 21), an all-in-one video and graphics accelerator that delivers 2D, 3D, and multimedia video capture and playback in a single AGP board design.

Intel Inside... Everything

Intel announced its new graphics accelerator Performance Software Developer's Kit (SDK), which provides tools for developers to optimize their games to run faster under

Blizzard In Your **Living Room**

ALLEGATIONS OF **SPYING ON CUSTOMERS** SNOWBALL WITH LAWSUIT

Blizzard Entertainment wanted to generate attention for the launch of its new strategy game *Starcraft*, but the ensuing controversy and lawsuit surrounding the release probably wasn't what the company had in mind.

Starcraft, Blizzard, and its free online gaming affiliate Battle.Net have been at the center of a growing privacy debate sweeping the net since the company acknowledged it secretly downloaded information from people's PCs.

The controversy began in early April, when Blizzard released *Starcraft* and made it available on Battle.Net. When users were unable to log onto the network because their CD keys were already in use, Blizzard officials said they began capturing information to see what was wrong.

"Initially we assumed there were piracy problems," said Susan Wooley, a Blizzard spokesperson. Wooley said only users who logged into Battle.Net with duplicate or bad CD keys had their names and e-mail addresses sent out.

Wooley said the company quickly traced the problem to manufacturing problems, stores that were reselling returned copies, and a number of pirates. But by the time Blizzard Entertainment stopped capturing information a mere seven days later, the damage had already been done. Savvy users monitoring the flow of data from their PCs noticed the information being snatched and began spreading the word electronically.

"It has come to my attention... that during any failed Starcraft BATTLE.NET connections... some sensitive information is (illegally) retrieved from your registry and sent up to Blizzard. I have personally confirmed this using socket traces," began one of the cryptic messages sent to several PC and gaming magazines, *boot* included.

"If a computer cracker takes information without permission, it is called theft," wrote Tony Martin in an e-mail to *boot*. "[Blizzard] placed a trojan horse in [its] software and then activated it to take information from users without permission. [In essence] Blizzard stole information from many people."

At the heart of the debate is whether Blizzard went too far and violated people's privacy rights by trying to protect its product. The controversy has snowballed, with Blizzard caught square in the storm's path.

> "It's a message to users that information on their hard drives is **not necessarily secure** from prying eyes when they're online."
>
> —*Barry Steinhardt, Electronic Frontier Foundation*

"How anyone can defend [this] invasion of privacy is sickening," commented Matthew Arnold.

Not all netizens decry Blizzard's actions. Many gamers who view Blizzard as a producer of top-quality games, such as *Diablo*, *Warcraft*, and *Starcraft*, point to software pirates as the true root of the problem.

"Not only do people have the balls to steal a product, but they then log onto Blizzard's own server to play for free and then expect the company to foot the bill for their theft?" wrote Stan Smith. "Bloody amazing!"

"Honestly, how can [people] be offended at this?" said Jon Resek, another *Starcraft* fan. "Piracy is a huge problem, but Blizzard is a

When online Starcraft *players discovered registry info being downloaded from their systems, Blizzard ceased its actions.*

company I trust."

Blizzard's troubles aren't limited to negative publicity and irked customers. Within days of Blizzard admitting it downloaded user information, Donald Driscoll, an Albany, CA, attorney filed suit against the company alleging unfair business practices.

The suit claims that Blizzard's actions violated California law on computer crime and that businesses that violate the law are engaged in unfair business practices. Driscoll is seeking to force Blizzard to release an updated version of the game with the ability to grab user information disabled and offer its customers a refund.

"I think this is a very important legal issue for the net," said Driscoll, who told *boot* that since filing the suit, he has received hundreds of e-mail messages. "A lot of it was supportive," he said, "but I've also gotten a certain amount of flame mail too."

Driscoll himself has now become the target of negative publicity campaigns characterizing him as a money-grubbing opportunist seeking nothing more than attorney's fees. However, Driscoll is quick to point out that Blizzard's actions alone created the entire situation and that people shouldn't make him the focus of raging debate.

"I hope the long-range impact is to have people really start thinking about these issues," Driscoll said.

For its part, Blizzard said all it wanted to do was make sure customers could use Battle.Net. The company's intent, stressed Wooley, was "not to capture pirates."

"We feel we've been pretty forthcoming since day one," she said. "Obviously people got upset with what we did, and we understand that. But there's not some greater conspiracy behind it."

Wooley said misinformation has spread at Internet speed to the corners of the planet, with people even contacting her accusing Blizzard of accessing their financial records.

"I think a lot of it is an example of how things can run amuck on the Internet," she said.

One widely repeated rumor was that, in addition to capturing e-mail and user information from Netscape's *Communicator* and Microsoft's *Internet Explorer*, Blizzard also snatched people's Kali e-mail addresses. Kali is a competing gaming network of Battle.Net.

When contacted by *boot*, Kali President Jay Cotton declined to comment on the situation, but did confirm that several of his users reported having their Kali info swiped.

Wooley flatly denied that Blizzard took information about their competitor and chalked it up to Internet rumor. She said Blizzard didn't intend to insult its customers.

"We definitely have learned from it," Wooley said. "And we'd never do it again."

However, the other lesson in all this may be that no matter how secure you think you are, there's always potential for harm.

"It's disturbing but not surprising," said Barry Steinhardt, president of San Francisco-based Electronic Frontier Foundation, when contacted about this story. "It's a message to users that information on their hard drives is not necessarily secure from prying eyes when they're online. Users need to take measures to protect themselves." b

NUGGETS

the Pentium II and i740 architectures. One new tool is Intel's Observation Architecture (OA), a set of hardware and software features built into the i740 chip that lets developers "peek" into the graphics pipeline and observe bandwidth utilization and throughput in several hardware operations. The other tool is "Profiler," a utility that lets developers gauge the performance of their application by monitoring the activities of the i740, as well as identify and eliminate bottlenecks in the graphics pipeline in realtime. Profiler shows the usage of various graphics hardware functions in realtime, such as pixel fill, engine, setup engine, texture cache throughput, local memory throughput, rendering rate, frame rate, and AGP throughput. The good news is that once a game is fully hardware-optimized under i740, the game should see improved performance under all hardware chips. The SDK is a free download from Intel's developer web site at www.intel.com/design/graphics.

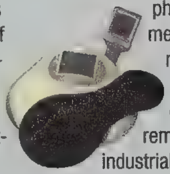
Intel also showed a computer purportedly running a 650MHz Pentium II; however, none of the bootBoyz were allowed into the back room to see it or run a few benchmarks. Guess we'll have to take Intel's word on it.

Microsoft Madness

Microsoft talked about DirectX 6.0, which will be implemented in NT 5 beta 2. Unfortunately, it won't be ready in time to be included in Windows 98. DirectX 6 will give you improvements in transform and lighting algorithms and a rewritten geometry code, and will recognize the processor in the box. Other enhancements include DirectSound Digital Audio, which solves buffer-management problems and simulates reverb, and DirectMusic, which will include a Roland software synthesizer to enable audio consistency across any soundcard.

Cool Products

ITU Research's TouchCube is a high-precision 3D input device that uses multiple finger movements. It's ideal for people who have to move within digital or physical environments, such as navigating VR spaces or controlling remote-operation industrial equipment. TouchCube lets users manipulate up to five 3D points or states independently and simultaneously.



Roland Digital's PICZA also looked interesting. A $995 3D digitizer, PICZA scans any surface at predefined resolutions. This touch-probe scanner is suited for designers, hobbyists, engineers, and 3D modelers.

Boston Acoustics has jumped into the multimedia speaker fray with satellite/sub combinations that range in price from $99 to $299. The high-end MediaTheater setup takes advantage of Virtual Dolby Surround circuitry, creating the effect of a full, five-speaker surround-sound system from only two satellite speakers.

Finally, Saitek had the coolest-looking game controllers on display at the show. Its new line-up features "Ratio Digital" technology, a patent-pending technology that dramatically improves joystick-to-PC communication speed.

Pyramid3D Is Dead, But Glaze3D Lives On

It was bound to happen. After years of promise and numerous less-than-spectacular demos, TriTech Microeletronics has decided to ditch its graphics business

NUGGETS

and has laid to rest its Pyramid3D technology.

The technology (first previewed in *boot* 2!) was forever trying to find a place in the videocard add-in markets. But despite its ability to do hardware bump-mapping acceleration, the part simply did not have the horsepower to go up against the likes of Voodoo^2, i740, or Riva 128. Even at last year's Comdex, while 3Dfx was wooing the crowd with liquid-smooth demos of games such as *Incoming*, the Pyramid3D was barely making it in the upper teens with the same demo.

The Pyramid3D joins comrades such as RSSI's PIX, Tseng Lab's 3DET6300, and others, who have all fallen in defeat.

Although it's dead, it may not be forgotten. Microsoft has licensed TriTech's bump-mapping technology for DirectX 6.0, and now BitBoys Oy—the same design team that engineered the Pyramid3D—is trying to pimp its own 2D/3D solution, the Glaze3D.

This new chip promises the world, with performance vectors such as 400 million dual-textured, illuminated, fogged, alpha-blended, anti-aliased, Z-buffer pixels per second. Specifically:

- 400Mpixels/sec gouraud-shaded pixels, no texture
- 400Mpixels/sec single texture with trilinear mip-mapping
- 400Mpixels/sec dual texture with bilinear filtering
- 200Mpixels/sec dual texture with trilinear mip-mapping
- 200Mpixels/sec quad texture with bilinear filtering
- 100Mpixels/sec quad texture with trilinear mipmapping

Feature sets will include:

- 200MHz operating speeds
- 32-bit/True-color rendering pipeline
- True-color framebuffer
- trilinear mip-mapping
- programmable triangle setup engine
- four simultaneous trilinear-filtered textures in a single pass
- no performance penalty on translucent surfaces
- bilinear bump-mapping, also with a surface texture
- edge anti-aliasing
- 16K texture cache
- stencil buffer
- up to 16MB of local memory
- flexible memory interface, including SDRAM, SGRAM, 400MHz RDRAM, and SLDRAM
- DirectX/Direct3D and OpenGL compliance
- PCI 2.1 and AGP 2x interface

No word yet on pricing or availability.

Katmai Reportedly Revealed

Intel's secret Katmai New Instruction sets, once dubbed "MMX2," appear to have been compromised by a programmer who said he found the information on an Intel public Internet site.

"I ran into an application on Intel's public FTP site that contains what I believe to be the KNI/MMX2 instruction set. I haven't got the whole encoding figured out, but the following table shows where they fit into the opcode map," Clive Turvey wrote on his web page (www.tbcnet.com/~clive/vcomwinp.html#KNI).

Katmai is expected to implement 4x AGP, an increased bandwidth to memory, and a Single Instruction Multiple Data Architecture for floating-point data types. CPUs using Katmai aren't expected to hit the market until 1999 and will initially hover in the 500MHz range. Katmai may also use a 200MHz bus in conjunction with Rambus technology.

Intel officials could not be reached for comment. ▯

Fake Pentium IIs Surface In U.S.

INTEL SAYS TEST TO **CHECK AUTHENTICITY** WORKS

After Taiwanese officials seized millions of dollars worth of fake 300MHz Pentium IIs earlier this year, more bogus processors were expected to surface in Europe. An investigation by German magazine *c'T* has since discovered the majority of fake P-II sales were to U.S. customers.

Some 333 cases of falsely labeled Pentium IIs were actually reported, including 210 from the United States, 42 from Germany, 13 from Australia, and 12 from Canada. Given the large number of counterfeiting rings in the black market, it's possible the worldwide figures could reach into the tens of thousands.

These counterfeit chips are actually overclocked 233MHz and 266MHz Pentium IIs doctored to look like the more expensive 300MHz or 350MHz varieties. If you get your hands on a suspect system, look at the CPU and check for "shimmering" where the part number would normally appear. A falsified part number (copied from a bonafide 300MHz part) will be printed elsewhere on the cartridge. In another variation, the cartridge has been spoofed, which can be detected by the smaller than normal Pentium II logo in an irregular position on the cartridge.

However, since the naked eye doesn't always see the whole truth, *c'T* created a software test that checks for the presence of error correction code in the L2 cache. According to Intel, ECC support wasn't added to the 233MHz and 266MHz parts until about a month after their introduction. Intel would only say the actual number of Pentium IIs sold that included ECC support "was more than a small number." No 300MHz Pentium IIs were sold without ECC support, but both non-ECC and ECC 233MHz and 266MHz Pentium IIs are still available.

Intel's Manny Vara said engineers checked the program and found it does correctly test for the presence of ECC in the L2 cache.

"If you run the test and it says your 300MHz processor does not have ECC, then there is a good chance that you have an overclocked or re-marked processor," Vara said. However, Vara stressed that Intel does not endorse the utility. He also warned consumers to be wary: "If you see a bargain that's too good to be true, then maybe it is."

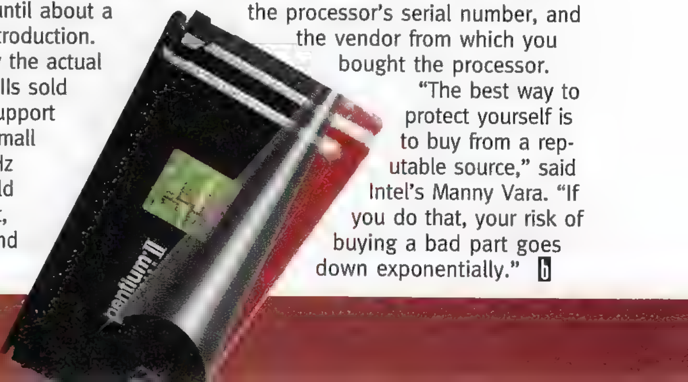
Still, a growing number of anxious consumers suspect they were taken for a ride.

"I got my 300MHz Pentium II from two Russian guys at a computer show in Valley Forge, PA," said Keith Jones in an e-mail to *boot*. Jones later discovered his processor was actually a re-marked 233MHz Pentium II.

> "If you run the test and it says your **300MHz processor does not have ECC**, then there is a good chance that you have an **overclocked or re-marked processor**."
>
> —*Manny Vara, Intel*

Consumers shouldn't panic yet. Intel urges anyone who thinks they may have a bogus processor to do two things: contact their vendor to report the alleged fraud, and contact Intel at 800.628.8686. If you call Intel, be prepared to provide contact information, the processor's serial number, and the vendor from which you bought the processor.

"The best way to protect yourself is to buy from a reputable source," said Intel's Manny Vara. "If you do that, your risk of buying a bad part goes down exponentially." ▯



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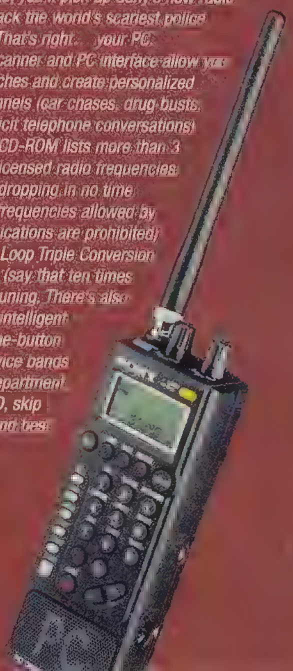
Cleving 156 Who hasn't felt like the consummate DJ while throwing a party for a mob of their closest friends? With a couple of $450 Cleving 156s, you could start to charge admission to your soirees and even quit your day job—not. But it's fun to dream anyway. This top loading CD player, is whisper quiet with a S/N of >102 and >95db dynamic range. Make sure the building is earthquake proof, because it booms an astonishing frequency response of 4Hz-20kHz. If that doesn't make your neighbors move out, nothing will. The BPM counter is perfect for those perfectly matched transitions between tracks, and +/-16% pitch bend will keep the music right in key. A jog shuttle is the only way to get that turntable feel for pitch as well as accurate scrubbing. **BST; 888.BST.0014; www.bstsound.com**

evolution Mouse-Trak Developed with the power user in mind, evolution Mouse-Trak is a radical-looking pointing device that aims to reduce fatigue. Using a ball-bearing trackball motion, the evolution trackball glides for fine movement, while six programmable buttons allow single-stroke action for single- and double-clicking, dragging, and other functions, depending on the drivers you're using. You'll need a PS/2 port to get this puppy up and running, though—it won't work with a PS/2-to-serial adapter. But it is fully programmable for left-handed users—a major plus. **Itac; 800.533.4822; www.mousetrak.com**

Revolve Designs' UniMount

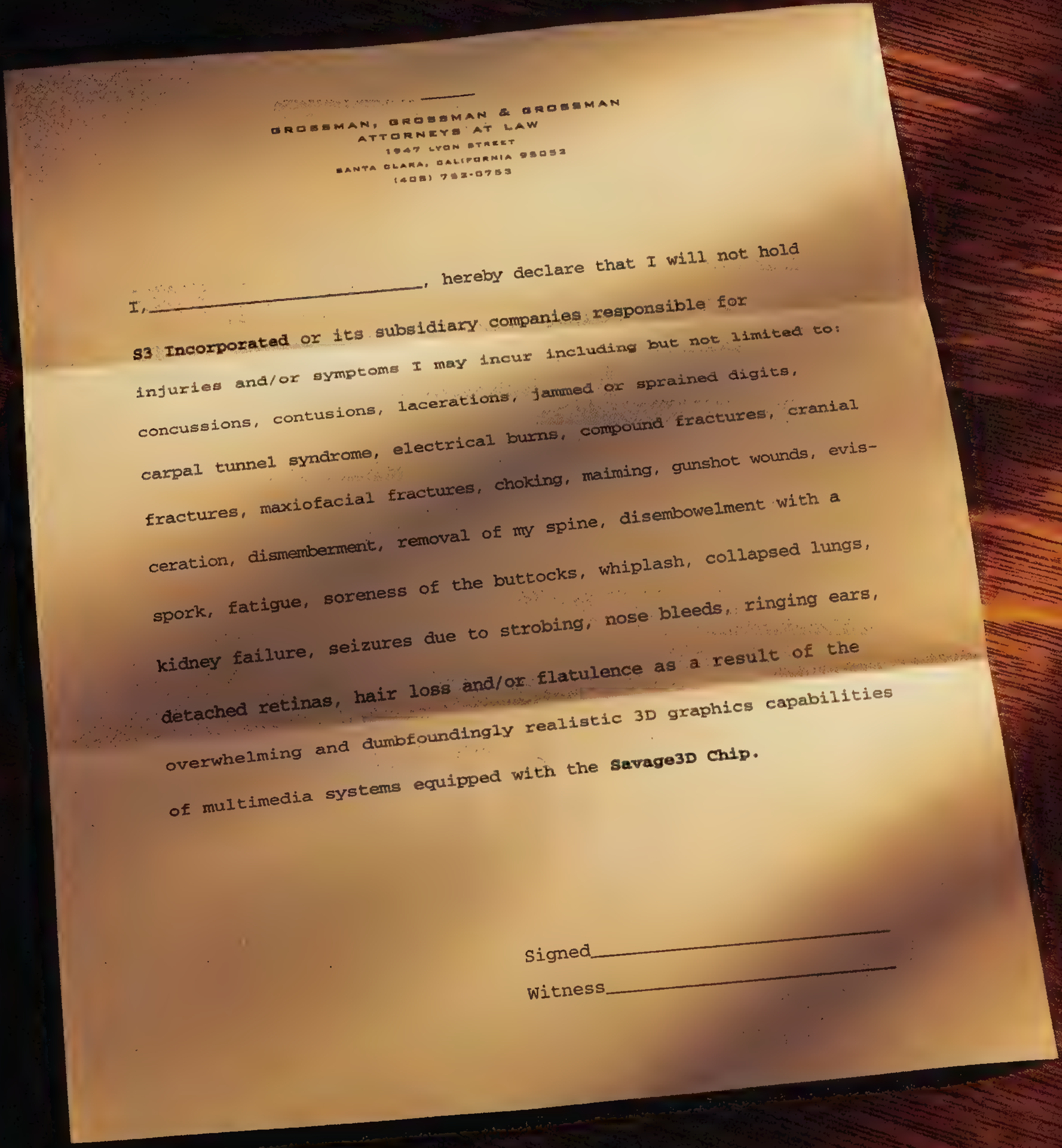
The Pilot was designed to be taken anywhere, right? But it can be tricky holding a stylus in one hand and trying to scribble a graffiti character while cruisin' in your ride. UniMount comes in a handful of configurations starting at about $70 and incorporates various suction cups, clips, or bolts to secure any PalmPilot for one-handed action. It comes standard with a Post-It note/battery holder, stylus/ball-point pen, and a velcro module to attach it to a monitor as well. Other models can dock a phone, GPS, or pager. **Revolve Designs; 800.580.2210; www.revolvedesign.com**



ICF-SC1PC Bad boys, bad boys, whatcha gonna do? If you're real bad, you'll pick up Sony's new radio frequency scanner and track the world's scariest police chases through your PC. That's right—your PC.

The $430 ICF-SC1PC scanner and PC interface allow you to custom-tailor your searches and create personalized files for your favorite channels (car chases, drug busts, domestic disturbances, illicit telephone conversations) on your PC. The included CD-ROM lists more than 3 million (phew!) U.S. FCC-licensed radio frequencies so you'll be up and eavesdropping in no time.

The scanner scans all frequencies allowed by the FCC (cellular communications are prohibited) and uses a Phase Locked Loop Triple Conversion Superheterodyne circuitry (say that ten times fast) for accurate, stable tuning. There's also 300-channel memory, an intelligent active memory system, one-button access to nine public-service bands (police department, fire department and aircraft), a backlit LCD, skip function, key protection, and best of all, a belt holder. **Sony; 800.222.7669; www.sony.com**



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Witness__________________________

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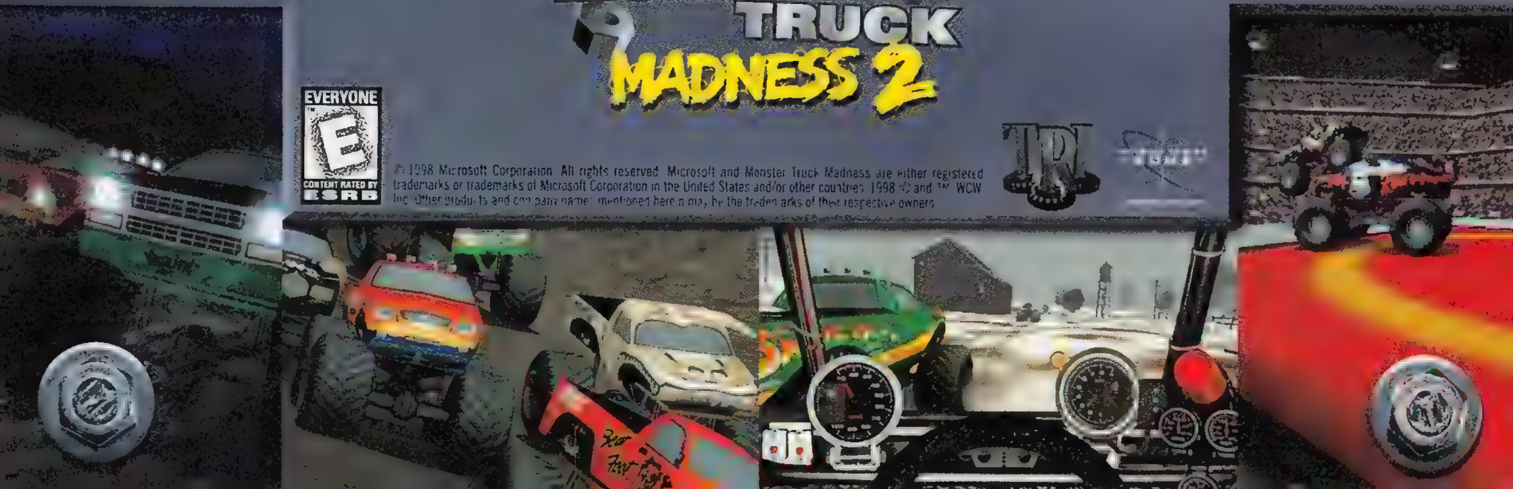

MICROSOFT DEFECTOR TELLS ALL

THE SAINT

WITH ALEX ST. JOHN

The **Trouble** with Being **Intel**

THE NEW ROUND OF CPUS IS BIGGER, BETTER, AND FASTER... **BUT WHO'S BUYING?**

These are fascinating days for Intel. I recently attended the launch of its latest CPUs and watched with amazement as a nervous sales guy struggled to justify the need for a new generation of processors. The core demand is in corporations, so Intel needed to show new and exciting uses for its 400MHz CPU and 100MHz system bus for business applications.

As it turns out, this is a remarkably difficult thing to do.

The first demo was an MPEG-2 video decompressing live onto the inside surface of a sphere, allowing you to look around at the video from all directions as it played.

Neat, but it was grainy, and Microsoft once did that same demo at the Computer Game Developer's Conference using a Pentium 90, decompressing MPEG-1 video in software.

Intel's audience didn't know this was trivial and was duly impressed.

The next demo was a data analysis package that streamed live data off the net into an interactive 3D graph with data-points represented by little 3D-rendered bouncing spheres with ambient lighting. The nice thing about rendering spheres under these conditions is that you only have to render one and copy the rest.

Quake it was not.

The third demo was a CAD package's 3D model of a car engine. The model looked to be no more than 10,000 polygons, probably less. It had no textures and was again ambiently lit with white light. They showed the engine rotating choppily in software, its pistons chugging along—not really something that justified more than a 166MHz Pentium, unless the developers were monkeys.

In order to **justify a 50% profit margin**, Intel must continually introduce faster processors, but what happens when the market **can't think of any use for all that power**?

Has Intel innovated itself out of market-share? To justify a 50% profit margin, it must continually introduce faster processors. But what happens when the market can't think of any use for all that power? Oh sure, you can always use a bigger network server or database, but what about the machines that sit on everybody's desktop?

The PC software industry has long been able to use Intel innovation as a crutch for sloppy software design and for creating huge, ponderous applications. Microsoft has certainly been able to manage to suck up most of the available resources and disk space on everyone's systems with productivity applications that, to my recollection, have pretty much run fine since the introduction of the 286.

Face it: They're all text applications. It must take enormous effort to make e-mail and browsers that visibly redraw the screen with some text and maybe a bitmap or two (*Explorer* has to load 22 DLLs to draw a bitmap), while id sprays fully lit 3D worlds at the screen with tons of AI-driven monsters at 30fps. While game developers still reflect their performance-oriented roots, business-application developers have grown incredibly fat and slovenly in their coding practices. Every year Intel has saved their cellulite-laden butts with a faster CPU. No need to optimize. By the time this beast ships, Intel will have shipped a faster computer, and even *Outlook* will chug along at an almost tolerable speed.

Corporate dollars are the bread and butter of the PC industry and, as demonstrated by the demos at Intel's new CPU launch, nobody can think of a use for all that power. And the net itself is limiting the application developers' ability to really suck up CPU. After all, even the lowliest CPU barely needs to work up a sweat displaying some text and bitmaps at 128K/sec, or even 10MB/sec for that matter. What's a big fat application to do while it's waiting?

I'm sure everyone reading this column can immediately think of a use for all that power. Entertainment. More specifically, aside from serving more data, the only technologies that actually justify that power are video (barely) and 3D (certainly).

ALEX ST. JOHN From his position as Microsoft's game technology evangelist, Alex St. John was responsible for the controversial DirectX APIs that have either taken PC gaming to the next level or were horribly broken, depending on your point of view.

This means the technology we all use for fun and games just reached center stage.

The primary use of video on the PC is—you guessed it—porn! And the primary use of 3D technology is games, more specifically *Quake*. Microsoft and Intel are desperately trying to develop better and better sex-and-violence technology to justify the value of the products to their corporate customers.

My favorite Intel ads are the ones that feature "videoconferencing." Stop! You're killing me! I'd bet that for every executive who actually uses that stuff for corporate meetings, there are thousands of guys out there tugging themselves blind. The funny thing is Intel can't promote its CPUs as better porn players, and even its fastest, newest CPUs can't beat last year's 3Dfx-enhanced 233MHz Pentium for 3D performance.

Thus, to keep those new CPUs rolling out the doors, Intel must find a way to make these two technologies ubiquitous and integral to all apps. This is why Intel and Microsoft have come together for the launch of Chrome, Microsoft's new 3D extensions for the desktop and Internet.

How is it that the PlayStation hardware hasn't changed in almost three years and the games keep getting better? In the absence of hardware innovation, software developers no longer have a crutch to lean their sloppy programming guts on. They have to suck it in and work a little harder to make better use of the resources they have.

And I don't think anybody would notice the impact if Intel didn't ship a new CPU for several years.

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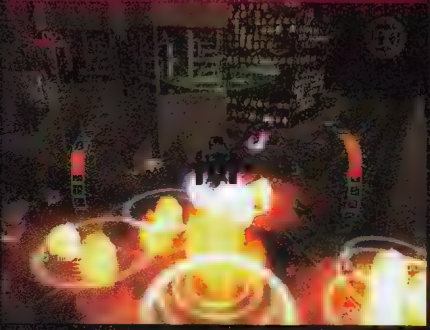

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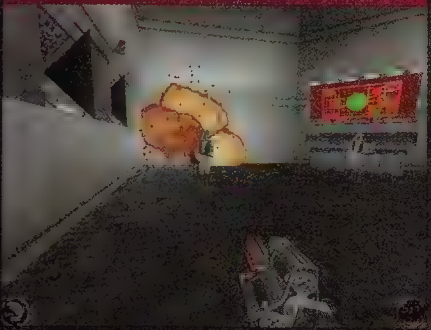

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THE SCOOP FROM A MAJOR PLAYER

GAME THEORY

WITH T. LIAM McDONALD

Here We Go **Again...**

IT'S OPEN SEASON ON **VIOLENT VIDEO GAMES**

T. LIAM MCDONALD is the all-knowing god of gaming. His mother still can't believe that he plays games for a living.

It seems as though I need to write this column every year, so here we go once again for the people in the cheap seats.

Violence in games does not cause violence in real life.

"Games don't kill people. Guns kill people."

"You can take away my mindless computer violence when you pry my cold dead finger from the joystick."

And so on.

But let's put away the bumper stickers for a moment and look at some of those messy things that media lords and political jackasses like to ignore. These dangerous things are called facts. Such as:

A study by Northeastern University found that juvenile violence more than doubled in the 1980s with the emergence of crack, but dropped almost 20% in the 1990s with the slight ebbing of the drug tide and an upsurge in the economy.

During this same period, the electronic entertainment industry experienced a stunning growth, with sales doubling during some years. More than half of the entertainment products published during this time were either graphically violent in nature or dealt with violent themes.

According to the Department of Justice, violent crime continued its long national decline with a 10% drop in 1995.

And then, of course, there's the messy issue of Japan, which has far more violent media than America, yet far fewer incidences of violent crime.

If entertainment actually affected the behavior of young people, juvenile violence should be increasing, not decreasing, as children reenact what they see on the screen and become further desensitized to violence. However, the government's own statistics simply don't bear this out. In fact, the statistics could be read to support the theory that violent games decrease violence in the young through their cathartic effect.

> That games fail to show the **moral and ethical consequences of violence** is irrelevant. It's not their place. Children get their moral guidance from their parents, not from a game.

Joel Saxe, of the University of Massachusetts, has reason to believe this theory. He studied a group of gamers and reported, "As players elaborate the meanings of the gaming experience, they interpret this play as a 'healthy outlet,' providing a form of catharsis, a means of releasing feelings of aggression. The play activity is also linked to feelings of positive accomplishment. The cathartic function of playing with fantasy bodily violence was repeated by a number of players who characterized the videoplay as an 'outlet,' a place to 'relieve stress and tensions,' 'to get rid of frustrations' and 'take out aggressions.' "

None of the major studies has found any definitive link between game violence and increased violent behavior. Indeed, such studies, particularly with children, are fundamentally flawed. If they are conducted under laboratory conditions, the results can easily be artificial. If they are done in the field, they lack the control groups required to validate research. In either case, they utterly ignore context and extenuating factors such as socioeconomic position, parenting, intelligence, home life, and other elements that figure into behavior.

And parents now have more tools at their disposal to make an informed decision than ever before. Boxes contain copious ratings, warnings, and graphic photos of the games themselves. *Redneck Rampage*, for instance, has a conspicuous "Mature: 17+" icon on the front of the box and a warning on the back that says the game contains "animated blood and gore, strong language, use of tobacco and alcohol."

But companies like to hype the violence in their games, not hide it. No publisher attempts to sneak an exploding monster into a game. It sells the game based on the promise that it is full of exploding monsters. No one can pick up the box for *Carmageddon*—with its picture of a businessman and a granny being run down and a tag line that calls it the "Driving game for the chemically imbalanced"—and wonder what's inside. If parents do not know the content of a game their child may play for upwards of forty hours, then it is because they choose not to know.

The violence in games is fantasy violence, and children know this. If a child cannot discern between fantasy violence and real violence, this child has a more serious problem than computer games. None of this entertainment exists in a vacuum, and the only real danger comes from parents who disassociate themselves from the entertainment their children seek. Parents need to be engaged and aware of what their children are seeing and what is appropriate for their age group. That games fail to show the moral and ethical consequences of violence is irrelevant. It's not their place. Children get their moral guidance from their parents, not from a game. A game would have to be very powerful indeed to cancel out good parenting, and no game is that good.

I'm forced to whack this dead carcass again because the media-politico nitwits that steer national debate are busy beating their chests over an imaginary "rise in juvenile violence." The case, of course, is the tragic shooting in Arkansas of a schoolyard full of children by two of their classmates. Without any proof, we are immediately told that it is the "culture of violence in the media, particularly video games" that caused this tragedy. Meanwhile, the covers of *Newsweek* and *Time* show photos of the child perpetrators in camo gear with large, very real weapons that, we may assume, were given to them by their parents.

Maybe we should amend that bumper sticker to read, "Guns and games don't kill people. Bad parents do." ▯

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U.S. Out of My Internet!

YOU NEED TO TRAVEL TO UNDERSTAND **TECHNOLOGY AND ITS LIMITATIONS**

It may seem that *boot* readers only want to read about pushing the envelope, the newest of the new, and the ultimate way to get the best for the least.

But I don't think so.

I think it's also useful for *boot* readers to know how people outside the U.S. use technology. This knowledge will help decision makers better understand the increasingly global market, as well as adjust their web sites to accommodate a broader audience. I won't deny the *boot* readers this valuable information on the basis that it isn't cool and hip.

<begin soapbox>

I was sitting in a kitchen in Izmir, Turkey (a few miles from the capital of Greek civilization back in 300 BC), and on the front page of the city newspaper was an article about the U.S.-centric approach to the domain-name registration process as outlined last winter by a U.S. Department of Commerce green paper.

I subsequently saw articles about this in other European cities. In Ecuador, I ran across similar articles about how the U.S.-centric nature of the web prohibited many South American citizens from even learning about the technology (as most of the online documentation and books are in English). Yet these articles seldom make it into U.S. magazines.

Domain-name registration is rapidly moving toward being regulated by the U.S. private sector. The aforementioned green paper, while making claims to encourage a global society and economy, doesn't advance that principle. If it did, it would have consulted the many existing organizations and corporations outside the United States before drawing up its global plan and submitting it to Congress.

This is nothing shy of another **obnoxious attempt** to edge closer to a **U.S.-controlled New World Order**.

The regulation and control of domain names is the most important issue facing the Internet right now. It's more important than e-commerce and taxation issues, more important than security issues even, because without a functioning Internet-address naming system, there would be no commerce to tax or guard against fraud. There would be no global Internet.

There would be even more confusion and fragmentation in an area that desperately needs a cohesive structure to support its rapidly growth.

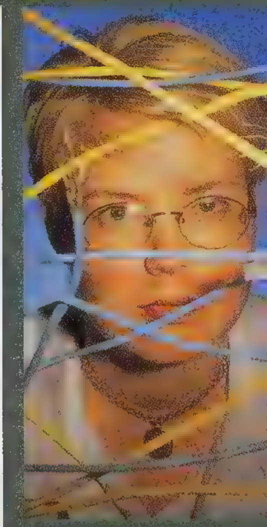
Perusing the web, I found some interesting critiques of the current proposal. The biggest issue seems to rest in just who will sort out trademark disputes, most showing concern that U.S.-designed plans favor big American business as opposed to small foreign entrepreneurs.

The Council of the European Union said, "...the current U.S. would, in the name of the globalization and privatization of the Internet, risk consolidating permanent U.S. jurisdiction over the Internet as a whole, including dispute resolution and trademarks used on the Internet.... The U.S. proposals do not bring about any significant improvements to the current situation, in particular with regard to the guarantees given to holders of trademark rights when registering domain names."

The European Union also maintains that the plan fails to acknowledge a competing proposal for managing Internet domain names established by a Council of Registrars (CORE) already set up in Geneva, Switzerland. Additionally it argues that the U.S. plan ignores efforts to set up Internet dispute-resolution procedures within the World Intellectual Property Organization.

The Internet Assigned Numbers Authority (IANA) added, "...the board of directors should represent the global Internet and its constituent users; the new organization should develop and maintain the criteria for registries and registrars with the consensus of the Internet community.... New top-level domains can and should be introduced to the system in a controlled manner by community consensus."

I'll be the first to acknowledge the crucial role the United States has played in Internet growth. U.S.-funded research and businesses have gotten us to where we are.



SHEL KIMEN no longer drinks coffee and can be reached at kimen@klever.org.

But the Internet is not used and supported only by the United States. Across the four continents I've visited this year, I've found a growing Internet industry in every town and city. Internet stories regularly appear on the front pages of foreign papers, and foreign universities have rapidly upgraded technology programs to deal with arising Internet-related issues.

If all this is so, why should the U.S. Department of Commerce regulate the Internet?

Could it be that NSI (Network Solutions, the U.S. company currently responsible for handling top-level domain names) has recently gone public? Could the United States see economic advantages for the companies that control this most important aspect of the Internet's future? It's clear the United States is eager to be Chief Officer of global trademark distribution rights and have control over the inevitable disputes. This is nothing shy of another obnoxious attempt to edge closer to a U.S.-controlled New World Order.

The spirit of the Internet, United States and beyond, has always been one of collective decision making and consensus. As Internet users, wouldn't you feel better supporting a collective, international process to regulate your Internet?

If this is important to you, not only should you let your congressional representatives know, you should also demand that your periodicals run stories about these issues, at least periodically.

</soapbox> ▯

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Product Information Number 233

Tough Choices Made **Easy**

THE **BEST SYSTEM** YOU CAN BUY IS THE ONE THAT **SUITS YOUR NEEDS**

By the end of this column, you'll either fall down on your knees worshipping my great judgment, or dismiss me as a geezer who is hopelessly unbootWorthy.

This column is about buying a new computer. It's an agonizing task we all face every few years, like filing tax returns. I know it's agonizing because I read your letters to *boot*. Most of you worry about taking the plunge and then discovering that Intel, Microsoft, or some other deity has announced a whiz-bang new product you've just gotta have. You suffer nightmares about instant obsolescence, which would make you uncool.

Other readers complain that *boot* goes overboard: Does anybody really drop $5,000 on a Dream Machine? Anybody except the stock-option millionaires in Silicon Valley? Your nightmare is the specter of financial ruin or the fear of looking uncool because you didn't buy the fastest chip on the block.

I'm here to heal your pain. Yes, it's OK to spend $5,000 on a Dream Machine. But it's also OK to spend $2,000 on a Lean Machine. Heck, it's even OK to seem uncool. As you'll learn, I do it myself.

You might assume that as an exalted and highly compensated *boot* columnist, I'd instantly spring for the $5,000 Dream Machine gloriously described in *boot* 13. Guess again. The machine I recently bought is what the bootLab folks might use to automatically switch off the lights when they go home. (Actually, they never switch off the lights because they never go home.)

You might assume that as an exalted and highly compensated *boot* columnist, I'd instantly spring for the **$5,000 Dream Machine**. Guess again.

Before you strip me of my geek status, hear me out. I believe that real geeks buy exactly as much computer as they need. Some geeks really need a $5,000 computer. Others get by quite nicely with a $2,000 or $1,000 computer. It's the fake geeks who always buy too much computer, because they're not hip enough to know what they need, so they overcompensate.

In my case, I needed a box capable of running the latest Java development tools. I determined that a 200MHz Pentium would be plenty fast for at least the next two years, which is a long enough time horizon to worry about. In fact, I shopped around for a discontinued non-MMX Pentium to save money, but settled for an MMX chip because the price difference was trifling.

Why was I willing to sacrifice MMX? Get ready for another shock: I don't play computer games. It's not that I'm a killjoy. I used to play games a lot—until I spent three years as the editor of an electronic games magazine. Have you ever seen the old "I Love Lucy" episode in which Lucy gets a job at a candy factory and gorges herself on the assembly line? Same thing. Long-term exposure to Nintendo triggered such a strong allergic reaction that I haven't played a game in six years, except occasionally in the line of duty.

Besides, I realized that I enjoy programming as much as I ever enjoyed games. Nerdy, but true. Although both diversions are challenging, games create artificial challenges, and you have less to show for your effort after you're done.

It turns out that when you're shopping for a new PC, an aversion to games is a wonderful thing. It greatly simplifies your decisions and immediately saves a couple grand. Pentium 200? Fast enough for my compilers. Quantum 2GB IDE hard drive? Big enough, fast enough. I bought a $57 Diamond Stealth graphics card that probably can't render 3D frames faster than I could draw them with crayons, but who cares? It scrolls my source code faster than I can read.

I asked the surprised store clerk for the slowest CD-ROM drive in stock—16x is plenty fast for installing software, and 32x drives really aren't much faster, anyway. I didn't even bother with a soundcard. Instead, I chose a motherboard that has integrated sound chips made by Creative Labs. Do I need a 64-bit PCI soundcard just so my interactive debugger can yell "beep?" Hell, no.

TOM HALFHILL is a senior editor at *Byte* magazine and the author of two computing books. He first became interested in computers during the disco era.

Two things on which I didn't skimp were the motherboard and the monitor. I paid a little extra to get an Asus TX97-XE motherboard because Asus is a good company, and I wanted an ATX board. This one has those integrated sound chips, plus integrated USB ports, SIMM slots, DIMM slots, a readable user's manual, and the latest BIOS code on the web. A good video monitor is even more important because it lasts through several systems and affects the health of your eyes, so I bought a 17-inch Sony 200ES.

My biggest problem was that I insisted on a desktop-style case, not a tower. That ruled out 95% of the ready-made PCs in stores. I asked a product manager at a leading company why towers are so popular. In a rare moment of blunt honesty, he answered, "Because our market research and focus groups show that people think towers look more powerful." But I despise towers because you can't put a monitor on top of them. So the tower either wastes valuable desk space or sits on the floor, where you kick it and have to crawl around to insert floppies and CD-ROMs.

My system cost about one-third the price of a Dream Machine, including the $750 monitor and exorbitant California sales tax. The first time I ran Symantec *Visual Cafe Pro*, it compiled my Java project so fast that I didn't think anything happened.

So who's really cool? The gamer who splurges on a $5,000 screamer to play *Doom* at triple-digit frame rates, or the hobbyist who buys a mid-priced system to carve some code? Or the workadaddy who buys a sub-$1,000 bargain box to run *Quicken* and play around on AOL?

Answer: All of the above. I'm OK, you're OK.

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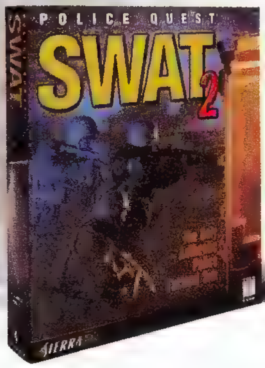

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Product Information Number 312

LINUX manifest

*Many have fallen to the mighty Gates OS regime, but all hope is not lost. For out of the darkness and despair a new world leader has emerged—**Linus Torvalds.** And only with Linux—his revolutionary OS for the masses—will salvation, security, and succor ever be possible.*

But a one-man army can't win a war, and Torvalds needs your help to deliver his manifesto to the world.

boot ***Let's discuss Linux's conception. How did it originate?***
Torvalds It really came to be because of my own personal needs. I was a student and a very poor computer person. I knew I couldn't live with DOS and Windows. I wanted to run somebody else's operating system and be happy and not worry. But nobody else's operating system fit my needs. You either had the really low-end, DOS, or you had the really high-end—the real operating systems, such as Unix, which nobody used as personal operating systems. They were used in commercial settings in universities, in research institutions—big places. And big places don't care if they throw $10,000 out the window because that's peanuts to them. But to a poor student like me, it wasn't peanuts.

So I got a teaching operating system, a small Unix-like thing that was meant to be a teaching aide of how operating systems worked. But it wasn't enough.

When I was 21, I was very self-assured when it came to programming and not very self-assured when it came to anything else. But I knew I was the best programmer in the world. So I just decided "Hey, why couldn't I do this myself?" And so I did.

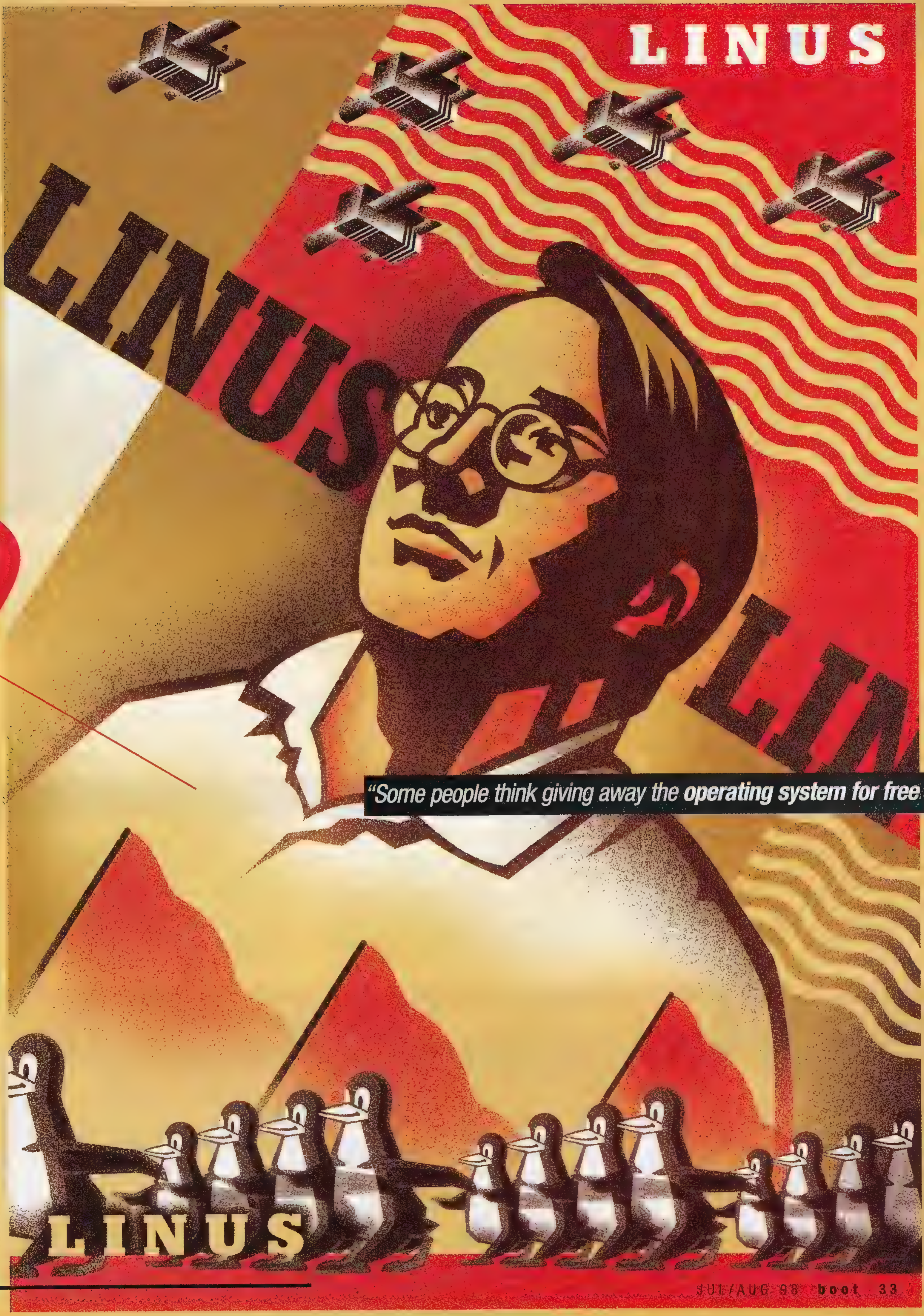
boot ***What were your needs at the time?***
Torvalds DOS didn't fit that bill, and Windows still doesn't. When I do something I expect the computer to do what I tell it to do because that's how computers are supposed to work. But if you're running Windows, MacOS, or a lot of other nonsecure operating systems, you really can't depend on the machine because there are too many bugs that can bring down the system.

And when there's too many things you can't depend on, you sit there nervously hoping it won't crash. I really hate not being able to trust the system.

boot ***And Linux is something you can trust?***
Torvalds Ultimately, yes. But when I'm doing very active development-such as adding new features—I'm doing stuff that really makes my personal system untrustworthy. I know I'm not immune to bugs either; but at the same time when something goes wrong, I can at least trust that I can fix it.

boot ***Linux is based on Unix, right?***
Torvalds Well it's based on Unix in the sense that I was used to Unix and really liked it. Unix has a philosophy, it has 25 years of history behind it, and most importantly, it has a clean core. It strives for something, some kind of beauty. And that's really what struck me as a programmer. Operating systems that normal home users are used to, such as DOS and Windows, didn't have any way of life. Nobody tried to design Windows. It just grew in random directions without any kind of thought behind it.

boot ***So what is it you hate about the Windows OS?***
Torvalds What's fundamentally wrong is that nobody ever had any taste when they did it.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"Some people think giving away the ***operating system for free*** **>**

ILLUSTRATION BY JAE SHIM PHOTOGRAPHY BY MARK MADEO

LIP

Microsoft has been very much into making the user interface look good, but internally it's just a complete mess. And even people who program for Microsoft and who have had years of experience just don't know how it works internally. Worse, nobody dares change it. Nobody dares to fix bugs because it's such a mess that fixing one bug might just break a hundred programs that depend on that bug. And Microsoft isn't interested in anyone fixing bugs—they're interested in making money. They don't have anybody who takes pride in Windows 95 as an operating system.

People inside Microsoft know it's a bad operating system, and they still continue working on it because they want to get the next version out because they want to have new features to sell more copies.

The problem with this approach is that over time nobody understands it, nobody *really* fixes bugs other than when they're really obvious, and the end result is really messy. You can't trust it because under certain circumstances it just spontaneously reboots or just halts in the middle of something. Normally it works fine and then once in a blue moon for some completely unknown reason, it dies, and nobody knows why. Not Microsoft, not the experienced user, and certainly not the completely clueless user who probably sits there shivering, thinking "What did I do wrong?"

That's what's really irritating to me.

boot ***Don't you think programmers at Microsoft are proud of their OS?***

Torvalds I think there's a lot of programmers who aren't in it for the money primarily. They're probably programming because they really like programming and Microsoft pays them well. A lot of Microsoft programmers are really proud, but they aren't really proud of the OS itself. They're really proud of being part of something that's really successful.

I don't think Microsoft is evil in itself. I just think that they make really crappy operating systems.

boot ***If they're so crappy, why don't people just say "Let's just use Linux"?***

Torvalds A lot of Linux users are people who really need the stability and are ready to say, "Goodbye Windows. I can't take this crap anymore." But inertia keeps people with Windows because there's lots of good programs. Hardware manufacturers look at the market and say, "Since most of the market is Windows 95, should we spend a lot of money developing for Linux or for Windows NT?" Microsoft actually has problems getting drivers for NT. They've tried to make the interfaces between drivers to NT and 98 as similar as possible so that there would be less resistance, even though it has a fairly small percentage of the market.

Some of that inertia may actually end up helping Linux too. Microsoft can't change all of its internals quickly because it has so many applications. But if an emulation library is good enough so you can run all the applications you really need on other platforms, Microsoft will quickly lose the advantage.

People have tried this. Java is a good example of that. If the Windows application wasn't tied to Windows, but was a x86 bytecode, there's nothing stopping us from running Windows programs on Linux, Solaris, or anything else. Sun had WABI, a Windows emulation package, but it had some serious resource problems and was never good enough to become a big player.

boot ***Can emulators actually work? Will people start using Linux just to see if they do?***

Torvalds I don't see that happening very

< somehow is tied to **communism.** These people think that **Microsoft is a good company,** because 'It must

Call Him The Orkin Man

boot ***The Linux FAQ claims that "whenever a version with new functionality is released, it almost always contains bugs." Why would anybody want to take that risk?***

Torvalds Every program contains bugs. What you want to do is to minimize the risk and maximize your personal goal. And to some people, the interesting thing to do is to tinker with new kernels. They don't care all that much about the risks because they usually aren't running mission critical applications; they just want to play around. And new kernels usually have new features or they're faster at certain things. So there is an incentive to upgrade to new kernels. Plus, to some people the risk itself is an incentive because a lot of people really enjoy being on the edge. It's exploration and people enjoy that. But some commercial companies don't want to take the risk. So they wait for the development process to finalize until they get the next stable version.

boot ***Are there more bugs in Linux than say there are in Windows?***

Torvalds No. Bugs in Linux are minimal and fixed very quickly. As an example, a networking bug that allowed you to send illegal packets was corrected within four hours. Most commercial Unixes had fixes within a week or two.

"When I was 21, I knew I was the **best programmer in the world**. So I just decided 'Hey, why couldn't >

be good if the richest man on Earth owns it.'"

quickly. WINE (the Linux emulator for Windows) works to a fairly surprising degree. You can run real Windows programs with it, but some of them don't look right, and some of them just crash. But it has been making big progress in the last year, and now you can actually run *Word for Windows*. It doesn't work for everybody and there are known bugs, but it's almost becoming usable. I doubt people will wake up and say, "Hey, let's get rid of the shackles of Microsoft and switch to Linux and WINE." But there are going to be more and more people who discover they really want the networking abilities of Linux, or who run a web server on it. WINE slowly expands the group of people who would find Linux or some other operating system acceptable because they really don't care about Microsoft per se; they care about a few programs.

In a few years WINE will be good enough that you can actually consider running Linux instead of Windows. It won't take over 100% of the market, but that's OK, too, because when you don't have one major entity that owns most of the market, it's a much saner, competitive environment. I think that'll happen, regardless of Linux.

boot ***What happens if it doesn't happen?***

Torvalds We'll see some real stagnation in what you can do with computers. Software companies are already scared of making products that are too good because Microsoft either starts to look at them, or buys them up. That scenario happens fairly often. The bad situation, which is equally likely, is Microsoft decides it won't spend money on buying this company because it can compete in the same market space. And then just by being this behemoth, it just rolls over this smaller company. It's kind of sad. This is supposed to be the land of opportunity, but many hardware and software companies are scared of Microsoft coming and taking their market away. Not by Microsoft being innovative, but by Microsoft just rolling over them.

boot ***Does Linux support multimedia better than Windows 95?***

Torvalds Well, it depends on what you want to do. For games, there are a lot of developers who really have to jump through hoops to get anything done using DirectX. There are actually game developers, such as id Software, who prefer working on Linux and developing all their software on it. When the game is ready, they port it to Windows because that's obviously the larger market.

For many multimedia applications you need A-1 reliability in timing. You care about the performance, but above all it should be smooth. You don't care about how many frames per second you can output; you care about the fact that you can output them at certain well-defined times. There's no point in trying to output 100 frames a second if all of them happen in the first half-second and the next half-second everything is still. And that's the kind of dependability that Microsoft has problems with.

Also, when it comes to the really interesting stuff, performance is a major issue. A lot of multimedia is getting stuff off disk and onto the screen. In many cases Linux just performs a lot better. But there a lot of development tools under Microsoft that you don't have with Linux. There are multimedia environments for Linux too, but you don't have the same choices you have with Windows.

boot ***There's a perception out there that Linux is difficult to install.***

Torvalds [interrupts] And it's completely wrong. But the perception comes from the fact that when you buy a PC, Windows is already installed for you. You don't actually see how nasty it is to install. Most people who want to use Linux are already used to Windows, and there's a small problem getting used to it.

So, yes, when you install Linux you have

Star Appeal

boot ***Do you consider yourself a celebrity?***

Torvalds Sometimes. At conferences I have a lot of people coming up and talking to me. But at the same time I don't have young girls coming and screaming at me and throwing their underwear! Which is just as well, as I'm a married man!

boot ***Do you wish you did?***

Torvalds No. I have enough recognition that I feel good about myself, that I know that what I'm doing is actually meaningful to people. And that's a really good feeling to have. Maybe it's not significant on a really big scale, but it's certainly enough that you can feel comfortable about what you've done with your own life.

LIP

Linus On... Life And Death

boot ***If Linux is considered a living entity, one must assume that it can die. Can it?***
Torvalds Sure. I think it's fairly unlikely, but miracles can happen. Maybe with some divine intervention, the next version of Microsoft's OS will actually be good. This is extremely unlikely, but hey...you never know.

You can also die a slower death, just keeping at the five-percent level for several years and just going the way MacOS eventually did. OS/2 was killed by bad management, and the MacOS was too tightly tied to certain platforms that were not economically viable anymore.

boot ***How long before MacOS disappears?***
Torvalds I think it will be completely gone in five years and I think it will be a really small niche market in two.

---

to do it yourself, but at least you don't have to reinstall it every time something goes wrong.

But there are political issues too.

boot ***Such as?***
Torvalds Some people think this open-source thing and giving away the operating system for free somehow is tied to communism. These people think that Microsoft is a good company, not because they're making good products, but because "It must be good if the richest man on Earth owns it."

< I do this myself?' And so I did."

These are people who don't look at anything except commercial success. I've actually gotten e-mail (not often, but occasionally) from people who say "Go home to Finland and don't take away these American jobs." But these people completely ignore the fact that capitalism is based on being able to compete in the marketplace.

boot ***If you were in charge of Microsoft's OS, what would be the first major change?***
Torvalds I don't know what there is to do anymore. They really can't change Windows 95 or 98. Too many programs depend on it. They can't muck around with the big kernels.

boot ***Do you ever see a time where Microsoft might release an OS that doesn't have any legacy support for applications?***
Torvalds No. They certainly probably want to, but at the same time they definitely don't want to open themselves up to the competition.

boot ***Do you have a Windows PC?***
Torvalds No. I really don't need to. When somebody sends me e-mail in *Word 5*, I just reply to them and say "Please send this in readable format." Even though I could start-up *Word for Windows* I choose not to. Of course, there aren't that many people who actually send me *Word* files. The people I e-mail with tend to know better! [laughs]

boot ***Compared to the BeOS and the MacOS, which seem to garner a lot of publicity, Linux is a silent OS. Why do you think that is?***
Torvalds It's marketing obviously. In number of shipped copies, Linux users number between 5 and 10 million, far beyond where BeOS is and about on par with MacOS. BeOS actually got most of its press by being the first Macintosh-centric OS. So it wasn't actually competing against Microsoft, and as such it had a much easier time getting press because it was competing against this other niche market, right? I don't think they're going to make it because it's just too hard to commercially compete with Microsoft right now.

boot ***Is Linux doomed to be a niche OS?***
Torvalds No, but I'm actually hoping that it won't take more than 25% or 30% of the market. If Linux owned 95% of the market it would be equally as sick. There is some need for competition.

boot ***Are you happy with the current level of success?***
Torvalds Yes, it's just incredible. Considering that it was a young university student who started this seven years ago, and now Linux is being considered by some as the only alternative to Microsoft, how much more successful do I need to get?

boot ***Can Linux survive without marketing?***
Torvalds With the Internet it can. Even though there is very little commercial marketing, there is a lot of noise about Linux on the Internet. You have a lot of Linux-specific and even nonspecific news groups out there. When it's a web newsgroup talking about web serving, probably the most popular platform for that is Linux.

Linux is more of a grassroots movement. It's not really planned; it just happens. And I think that Linux has enough features that it can make-do without marketing.

boot ***You've got a full slate of global developers working on Linux. Why hasn't it devolved into chaos?***
Torvalds It's chaos that has some external constraints put on it. For example, the pure kernel has a copyright that says that whoever does Linux development doesn't need to go through me. If Microsoft—or anyone else—wanted to, they could take Linux tomorrow, start development on it, and do it completely on their own. However, they're required to make all the changes available to everybody else. This "no ownership" idea means that the only entity that can really succeed in developing Linux is the entity that is trusted to do the right thing. And as it stands right now, I'm the only entity that has that degree of trust.

It allows chaos, but at the same time it has certain built-in things that just make it very stable. But you really need to be very good to take over development. Knowing that the best person will be there to pick it up is exactly the kind of security feature you need in a development network.

boot ***By nature of your current stature, some would accuse you of profiting from Linux's success. Have you done that and does this diminish Linux's overall "free OS" movement?***
Torvalds Profiting? I'm getting a lot of recognition and some of it is not necessarily deserved. I've done a lot of the really core functionality of the kernel, but there's been hundreds of other people who have written drivers for specific devices. And to some degree they get less recognition than they really should in this area because I'm the only person who people really see as the figurehead of the development. Bill Gates gets all the glory for Microsoft even though he's got thousands of people working for him.

boot ***Are you making any money on Linux at all?***
Torvalds No. Because I made Linux, I was able to make a name for myself, and I have a much better job than I would have otherwise. So that kind of indirect thing obviously exists. A few years ago people knew I was a poor student. At Christmas time I used to get a few personal checks of $100 or so. It didn't pay for development, but it was nice knowing that people care so much they're willing to pay even a small amount of money just because they want to.

"I don't

boot ***Is "Linux" a variation of your name?***
Torvalds Yes. Originally the official name was supposed to be Freix (pronounced "freaks"). But it turns out that the person who had the FTP site in Finland didn't like the "Freix" (the "ix" is from Unix), so he decided on Linux instead.

boot ***Is there a platform that Linux can't be ported to or used on?***
Torvalds I used to think you really wouldn't want to port Linux to anything without a good memory-management unit, and then a few crazy people actually ported Linux to the PalmPilot. And once somebody has done something like that, it has to be portable to just about anything.

boot ***Is Linux still useful as a teaching aid?***
Torvalds Yes. When you're teaching about operating systems, you need to be able to show how things are done. And with Linux this is trivial because you have sources and you have no obligations put on you from those sources. Microsoft has given source licenses for NT to big universities. But in giving those source licenses they tend to require certain things, such as requiring the students to sign nondisclosure agreements. While that's OK for a certain class of school, it's not OK for a university that thinks it should allow people to also talk about what they have learned. So any serious university would not accept that kind of license.

I've actually been disgusted how many

nonserious universities there are. There are universities that are considered to be reasonably good but teach people skills that must not be used in a professional capacity, except if they happen to be professionals at Microsoft. I find that to be fairly immoral for a school.

boot ***You and Bill Gates walk into a dark alley. Who walks out?***

Torvalds [laughs] I have no idea. I think both.

boot ***Why?***

Torvalds I don't think Bill Gates dislikes me personally. I don't think he lies awake during the night. I think he's very aware of Linux, but I don't think he's worried, at least not yet. And for reasons I've already outlined, I'm not worried about Bill Gates because I don't care about the marketing side. Bill Gates is always mentioned to be this super programmer and is head of this big software firm, but he's really a marketing person. He used to know how to program, but I don't think he's programmed in a long time. Linus Torvalds and Bill Gates don't exist in the same sphere.

boot ***Would you ever work for Microsoft?***

Torvalds Yes. I wouldn't say no to a job just because it's Microsoft, but it would have to be a real dream job, and right now I don't see Microsoft having that kind of dream job. But I don't have any religious belief that Microsoft is evil and that Bill Gates is Satan.

boot ***What features do you have lined up for the next version?***

Torvalds The next version is not going to be a big step. It's going to be mainly a performance release. It's more of a maturity thing. 2.2 will officially add the PowerPC and SPARC support, and improved SMP support. I expect it to be released sometime this summer.

boot ***What about version 3?***

Torvalds We don't have any real plans. The obvious things we're looking into are clustering and more scalability. And we want to support certain things that WINE needs for Windows emulation. Version 2.2 will have more support for Window threading under WINE. Linux has had threading support for some time, but it still isn't window-specific.

boot ***If you were sitting on a plane next to a CEO of a Fortune 50 company that wasn't using Linux, what would you say to persuade them to use it?***

Torvalds The sad thing is that a Fortune 50 company probably is using Linux, but the CEO won't know it. So they'll be using Linux in the engineering department or in support or something like this, but it won't be obvious enough that the CEO will be aware of that fact.

The one common way that Linux gets adopted inside organizations is by a small group of people who are working on a very specific project. They set up servers for their project and use Linux because it's usually the choice that needs the least paperwork. It isn't officially supported anywhere, but it's used in various places and then half a year later when another group has similar needs, they take notice. Sometimes companies decree "this is unacceptable," but most usually unofficially bless it.

boot ***Will there be a time when Linux won't be available for free?***

Torvalds No.

boot ***You say that very quickly.***

Torvalds Yes. One of the reasons I say it quickly is I've been asked the question before, and I also have made certain there is no way anybody can take the freeness away. I very strongly feel that it's a good thing, and the copyright requires it. And when somebody sends me big patches, I don't ask them to assign the copyright over to me. So right now, for example, the kernel itself has probably on the order of 50 or 100 copyright holders and the actual copyright license has always been the same. It's the GPL that requires that sources always be available. So in order to make a version of Linux that is not under that license, you have to get all those copyright holders to agree to the new license. The parts of the kernel that I own completely are significant, but they aren't enough to really make a good system. I did that consciously. I wanted to bind my own hands so that even if people don't trust me personally, they trust the fact that even if I wanted to turn commercial, I couldn't.

boot ***What would Linux's tagline be?***

Torvalds Very early on I reached the conclusion that anything I ever get in e-mail is just hot air until I see some real code or some real fruit of the discussion. So we used one that we stole from Nike: "Just Do It". It says don't spout fire, just do it; and then after it's done, show the world.

boot ***What's up with the penguin?***

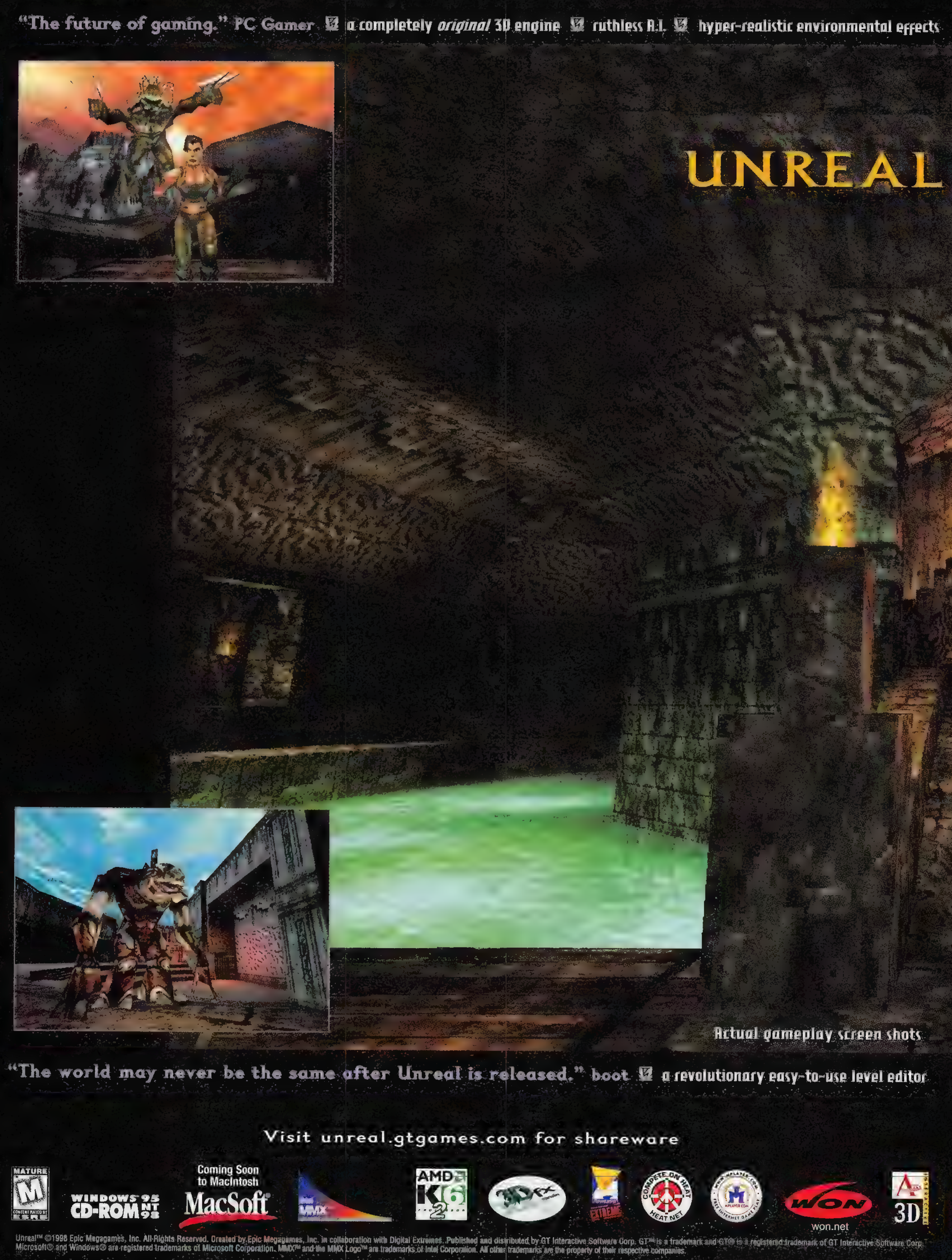
Torvalds The penguin doesn't have any real meaning, but it relates to a trip I took to Australia four or five years ago when I was bitten by a fairy penguin.

boot ***What the hell is a "fairy penguin?"***

Torvalds Fairy penguins are these ferocious animals about ten inches high with a beak that couldn't kill a human or even a smaller animal. Unfortunately, one bit me when I attempted to pet it. It was love at first sight.

A few years later when we were discussing what kind of logo people wanted, I decided on the penguin. Some people are still unhappy because they think that it's too noncommercial, but it's meant to be more fun than serious. I'm much happier being associated with a fun and slightly irreverent logo than with something static and boring.

*think **Microsoft is evil** in itself; I just think they make really **crappy operating systems.**"*

"The future of gaming." PC Gamer ☑ a completely *original* 3D engine ☑ ruthless A.I. ☑ hyper-realistic environmental effects

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Product Information Number 152

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- **PROCESSOR** *AMD-K6-2 With 3DNow! Technology*
- **TYPE** *Pentium MMX–compliant CPU with enhanced floating-point code*
- **CPU INTERFACE** *Socket 7 321-pin Zero Insertion Force (ZIF) socket*
- **DIE SIZE** *9.3 million transistors, 81-mm^2*
- **CORE VOLTAGE** *2.2V*
- **FABRICATION SIZE** *0.25 micron*
- **CORE/SYSTEM BUS SPEEDS** *266MHz/66MHz, 300MHz/100MHz, 333MHz/66MHz, 350MHz/100MHz (95MHz bus speed also available)*
- **L1 CACHE** *64K split between 32K data and 32K instruction*
- **L2 CACHE SIZES** *512K to 2MB (dependent on core-logic chipset and motherboard maker)*
- **L2 CACHE SPEEDS** *66MHz/95MHz/100MHz (dependent on CPU and jumper settings)*
- **COMPATIBLE CORE-LOGIC CHIPSETS** *VIA MVP3, Acer Laboratories Inc. (ALi) Aladdin V, SiS 5591 (pending final testing on 100MHz bus)*
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  300MHz $281
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  350MHz TBA

PHOTOGRAPH BY AARON LAUER

6-2 3D CPU?

Advanced Micro Devices releases a CPU loaded with 3D firepower. Our benchmarks tell conflicting stories. Are you ready to drop Intel and take the plunge?

AMD-K6-2, the 3D CPU. It's a bundle of messy abbreviations, but if you're looking for abbreviated polygon rendering times, the new processor is your ticket to faster 3D gaming. The K6-2 is loaded with 3DNow! technology—21 hard-coded instructions designed by a group of Intel competitors to widen the floating-point bottleneck and give you whip-fast frame rates. And guess what? The K6-2 delivers as promised. 3DNow! does dramatically improve 3D performance, and all at a price that should give Intel the willies. Within the next few months, you should be seeing low-cost gaming systems stuffed with K6-2s, kick-ass 3D accelerators, and awesome soundcards for just $1,000. AMD says the K6-2 family directly competes with the Pentium II lineup, and it will beat Intel's prices across the full spectrum of core processor speeds. All in Socket 7.

But can you live with a dedicated gaming machine at the expense of all-around performance? We've got answers to all your burning K6-2 questions, including how the K6-2 stacks up against the Pentium II, why its unoptimized floating point is still broken, and whether software developers will rally behind 3DNow! technology.

—Andrew Sanchez

What's the K6-2? What happened to the K6 3D?

The K6-2 is the "processor formerly known as K6 3D." Initially launching at 266MHz, 300MHz, and 333MHz with a Socket 7 interface, the K6-2 looks just like a Socket 7 Pentium processor. Later this year, the K6-3 will bring integrated L2 cache and possibly even motherboard-based L3 cache to the Socket 7 mix. The current AMD plan calls for K6-3 to be compatible with today's 100MHz Socket 7 motherboards.

Let's get one thing straight: The K6-2 will *not* replace your 3D accelerator. Got that? Good. The K6-2 processor is slated to be the heart of a faster rendering pipeline and works in tandem with a dedicated 3D accelerator.

What is 3DNow! technology?

3DNow! is a group of 21 new instruction sets that support Single Instruction Multiple Data (SIMD) floating-point operations and includes SIMD integer operation, data prefetching, and faster MMX-to-floating-point switching. To understand AMD's newest instructions, you'll need a primer on the realtime 3D rendering process. Polygons come to life in four essential steps: physics management and internal tracking, geometry transformation, triangle set-up, and pixel rendering (see sidebar next page).

So where does the 3DNow! technology come into play? Simple. 3DNow! alleviates floating-point bottlenecks to improve performance during the first three steps of the rendering process.

No matter how clever a programmer you are, you can't execute more than one floating-point instruction per clock cycle.

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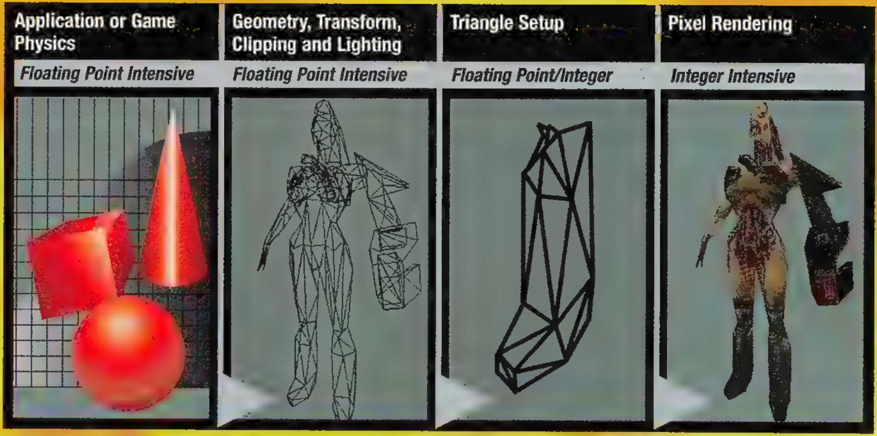
motherboard options > 43
industry reaction > 44
the benchmarks > 45
bootBoyz blabber > 45

THE 3D PIPELINE

Putting the 3D into 3DNow!

Floating-point processing is an integral part of the 3D rendering process. But where does it come in, and where can 3DNow! help? Dig the four-part process:



The first three steps in the 3D pipeline are floating point intensive and leverage the new 3DNow! instructions. Pixel rendering is still handled by the graphics chipset and that's why visual quality varies so much from card to card.

1. Physics management and internal task tracking. *There's more to a 3D game than just pumping pixels. In the first part of the rendering process, the game tracks object location, trajectories, in-game physics models, and scores, usually under the watchful eye of the CPU's floating-point registers. As 3D games push the bounds of virtual reality, realistic physics models become more important. Wood must behave differently than granite when struck with a sword, and in order to simulate the attendant mathematics in realtime (along with sundry other physics models), the game requires considerable CPU power.*

2. Geometry transformation, clipping, and lighting. *This is where mathematical coordinates are translated into sets of triangles; unnecessary polygons are removed; and triangles and light sources interact. With multiple objects, multiple light sources, and a virtual environment to track, this is very floating point intensive.*

3. Triangle setup. *This is where polygons are positioned in the virtual world—all according to the correct point of view, be it first-person or third-person. Unless your 3D accelerator has hardware triangle setup, your CPU will always handle this task.*

4. Pixel Rendering. *This is where pixels get put on-screen and textures get slapped onto each of those pretty lil' polygons—this is also known as rasterization. Back in the days of yore, the host CPU and videocard assumed the responsibility for pixel rendering. Today, rasterization is the realm of the dedicated 3D accelerator.*

This is the bottleneck with current Intel technology. With 3DNow!, however, up to four floating-point instructions can be executed per cycle, giving developers a wider floating-point pipeline with which to address physics, geometry, lighting, clipping, transformation, and triangle setup.

Intel's MMX instruction set only addressed integer operations and pixel rendering, the back end of the 3D rendering pipeline. 3DNow! uses SIMD protocols similar to MMX but goes after floating-point operands instead of integer. What's best, the new AMD-K6-2 processor merges MMX and 3DNow! instructions, allowing developers to switch effortlessly between MMX (integer) and 3DNow! (floating-point) modes.

> **"THE BIGGEST BOTTLENECK TO 3D GRAPHICS PERFORMANCE THESE DAYS IS THE CPU ARCHITECTURE, NOT NECESSARILY THE CPU SPEED, AS MOST PEOPLE THINK."**
>
> **—David Kirk, nVidia**

Wait a minute, doesn't mode-switching entail a performance hit? It does in MMX.

Yes, but AMD says the hit can be minimized with 3DNow!'s Fast Enter/Exit of MMX or floating-point state instruction (FEMM). FEMM can be used for MMX or 3DNow! switching to floating point, and is touted as twice as fast as the regular Enter/Exit of MMX or floating-point state instruction (EMM). Floating-point, 3DNow!, and MMX execution can occur simultaneously. The AMD-K6-2 handles the hardware switching, so there's no switching overhead between 3DNow! and MMX code execution.

How will games take advantage of 3DNow!?

Games must either leverage 3DNow!-optimized drivers or be specifically coded to take advantage of the new instructions. The first model requires the cooperation of the engineers behind DirectX 6, OpenGL, and chipset-specific APIs. The second model demands attention from game developers, who must assemble software subroutines themselves. Games that employ 3DNow! will enjoy faster performance, as the first three steps in the 3D pipeline are enhanced. Developers can use this benefit to increase frame rates or parlay it into more complex 3D worlds and physics models.

The degree of performance gain is determined by how many 3DNow! calls are sprinkled throughout the programming layers. For the lowest level of benefits, only the game itself is modified to support 3DNow!. For even better performance, in true DirectX 6 apps, transformation and lighting pipes can be addressed on the API driver level. The next step up is to run optimized videocard drivers for triangle setup and transfer to the video hardware (AMD is assuming the responsibility of optimizing device drivers for each chipset manufacturer). For maximum performance, a game will both leverage optimized drivers and be coded internally in software.

ATI (3D Rage Pro), Matrox (MGA-G100/G200), nVidia (Riva 128), and 3Dfx (Voodoo^2) are among the many companies committed to the cause. "I think that 3DNow! is very powerful and a huge improvement," says nVidia's David Kirk. "The biggest bottleneck to 3D graphics performance these days is the CPU architecture, not necessarily the CPU speed, as most people think. The problem with current K6, Pentium, and Pentium II CPUs is only partly their floating-point performance—which is helped by the 3DNow! extensions—but also the data movement, cache, memory, and bus performance. So, a hidden benefits of a 3D instruction set extension is that it optimizes memory traffic, and that's an even bigger win."

3Dfx's Tony Tamasi is also optimistic. "We're enthusiastic about any new technology or instruction set that improves the system's ability to deal with 3D graphics in a more efficient manner," says Tamasi. "The SIMD floating-point instructions included in the 3DNow! instruction set, combined with improved methods for moving and managing memory, can allow the new K6-2 processor to realize dramatic improvements in many stages of the 3D pipeline."

Intel will not do any optimizations for its i740 part. Go figure.

What about plain, old floating point? Has that been fixed?

The AMD-K6-2 continues to use its own short, two-clock, nonpipelined floating-point unit (Intel uses a hyper-pipelined approach). To yield high performance, code needs to be optimized for this nonpipelined approach. In other words, the K6-2's higher core CPU speeds and system-bus speed notwithstanding, the floating point is the same-old, same-old. This performance hit showed up during our DOS *Quake* benchmarking. The software rendering mode relies heavily on floating-point operations, and when the K6-2 was pitted against a Pentium II of the same speed, AMD's new chip was slapped around badly (see benchmarks on page 45).

Is AMD alone in challenging Intel?

Fellow chipmakers Cyrix and IDT have agreed to use 3DNow! in their forthcoming Socket 7 chips. AMD originally announced 24 new instructions, but peeled back to 21 to accommodate others.

"3DNow! is the set of instructions jointly developed by Cyrix and AMD, and we plan to implement the instructions in future products," says Cyrix's Wendell Watson. "Last year during the Microprocessor Forum, Cyrix and AMD announced separate plans to develop and introduce 3D instruction sets. Discussions with Microsoft and other software developers convinced both Cyrix and AMD of the advantages of coming together to develop a single standard for 3D instructions. We have not been waiting. We have been working hard at making it happen. Engineers from the two companies worked in concert to combine what were similar, but not identical, specs into a single spec."

Still, AMD, Cyrix, and IDT must confront Intel. The forthcoming Katmai New Instruction Set, Intel's enhanced double-precision floating-point instruction set, will debut in early 1999. Says *boot* columnist Tom Halfhill, "3DNow! is a good extension, but I wonder if it'll really matter in the long run. When Katmai comes out, AMD, Cyrix, and Centaur will almost certainly support those new extensions, too, and developers will probably start using the Katmai instructions. Seems like AMD went to a lot of trouble just to get a few months jump in the marketplace."

AMD SAYS ITS JUMP TO A 100MHZ SYSTEM BUS IS MUCH MORE PROFOUND THAN INTEL'S JUMP TO THE SAME SPEED. THE MAGIC LIES WITHIN THE SOCKET 7 L2 CACHE ARCHITECTURE.

Where does the 100MHz system bus sit with the odd-speed processors, such as the 266MHz and 333MHz?

When looking at K6-2, it's important to note exactly where you'll be getting that fat 100MHz frontside bus. According to spec, only the 300MHz K6-2 will be endowed with a 100MHz frontside bus. If you really must have a system bus faster than 66MHz with the other CPUs, you can overclock them using a 95MHz clock frequency—a speed AMD hopes to make a new standard with its "Super 7 Initiative."

For example, the 266MHz K6-2 (66MHz x 4) can go to 250MHz (100MHz x 2.5) or 285MHz (95MHz x 3), while the 333MHz (66MHz x 5) processor can be tweaked to 350MHz (100MHz x 3.5). Even the 300MHz (100MHz x 3) can be juiced up to 333MHz (95MHz x 3.5).

AMD hopes that some OEMs will actually sell 266/66 machines as 250MHz machines, in the event someone wishes to ride the 100MHz bus and gain that performance edge. This speed increase is also seen in the L2 cache bus interface, which is also boosted to 100MHz.

AMD says its jump to a 100MHz system bus is much more profound than Intel's jump to the same speed. The magic lies within the Socket 7 L2 cache architecture. Socket 7 L2 cache is currently on the motherboard, not closely coupled to the CPU itself (as is the case with the Pentium II), and therefore benefits more profoundly from a faster system-bus speed. AMD says the K6-2's L2 cache, read look-ahead and write chipset buffers, local bus transfers, and main-memory speed—all operating at 100MHz—offer better performance than the Pentium II/Slot 1 paradigm (Intel's L2 cache operating at half the core CPU speed notwithstanding). This makes a 300MHz K6-2 equal to or faster than a 300MHz P-II—even with a 150MHz L2 cache.

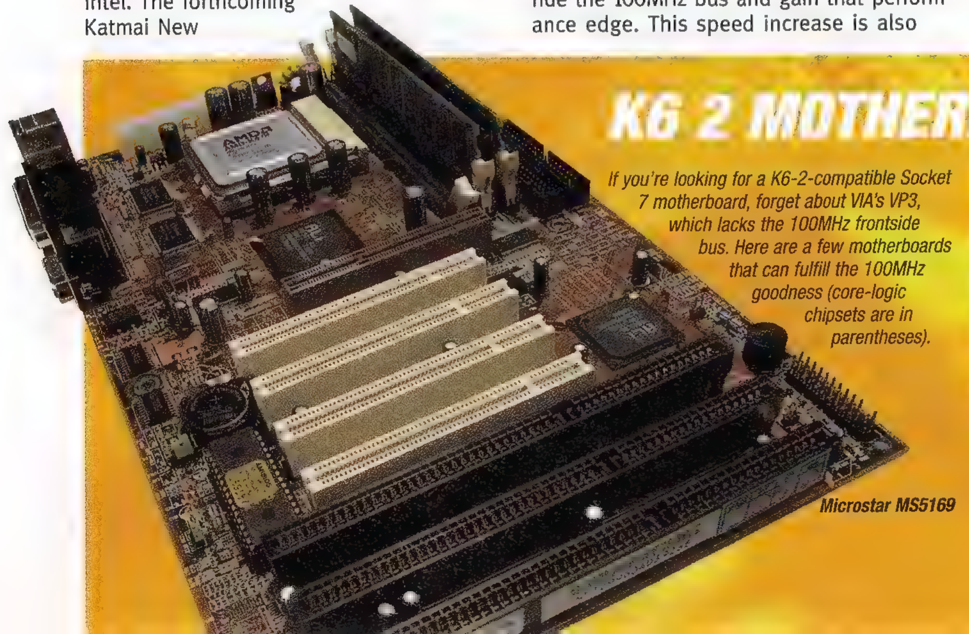
What games will take advantage of 3DNow!?

AMD went to developers and asked them point-blank: "What do you want to see in a next-gen CPU?" The developers asked for improved floating point. Hence the 21 new instructions. But which games are gonna use 'em?

Those onboard include DreamWorks' *Trespasser*, Epic MegaGames' *Unreal*, Rage's *Incoming*, Microsoft's *Baseball 3D*, Crack Dot Com's *Golgotha*, Simis' *Team Apache* and *Xenocracy*, and all of Digital Anvil's forthcoming projects, including *Conquest*, *Loose Cannon*, and *Freelancer*.

Quake II will enjoy the 3DNow! benefits, but not via native code. "We don't intend to release a custom version of *Quake II* with AMD-specific code," says id Software's John Carmack, "but because *Quake* uses the OpenGL geometry subsystem, hardware vendors can accelerate all OpenGL programs by using the instructions in the ICD. An AMD optimized OpenGL can be a good bit faster

K6 2 MOTHERBOARD OPTIONS



Microstar MS5169

If you're looking for a K6-2-compatible Socket 7 motherboard, forget about VIA's VP3, which lacks the 100MHz frontside bus. Here are a few motherboards that can fulfill the 100MHz goodness (core-logic chipsets are in parentheses).

FIC 1st Mainboard 1stVA-503+ (VIA MVP3)
DataExport MVP7598 (VIA MVP3)
ENPC EP-PI11 (VIA MVP3)
EPoX EP-58MV/P3C-M (VIA MVP3)
Soltek SL-54U5/SL-54U1 (VIA MVP3)
SuperPower SP-V586HB (VIA MVP3)
Win W5VIA/W5VIB (VIA MVP3)
Abit IT5A (Ali Aladdin V)
Microstar MS5169 (ALi's Aladdin V)
M-Tech's Mustang AGP-R581A (SiS 5591)

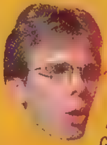
Other major vendors jumping on the VIA core-logic chipset bandwagon include Microstar, SuperMicro, Tyan, Tekram, and Shuttle.

INDUSTRY REACTION: WHO'S IN, WHO'S OUT?

"One of the hidden benefits of a 3D instruction set extension is that it optimizes memory traffic, and that's an even bigger win. The 3D extensions are definitely a good thing for the industry."
—David Kirk, nVidia, chief scientist

"We are very impressed with the focus that AMD now has on games. They have realized that games are the way to reveal the prowess of their processors. Shiny is committed to supporting all new technologies, so you can assume we will be working closely with AMD. My technical staff have been through [3DNow!] with a fine-toothed comb. The result seems to be that AMD really does 'get it' and is going to become an ally in making leading-edge 3D titles. Our Messiah *technology automatically pushes the K6-2 to its limit. It adds polygons in realtime until the machine finally says 'that's the best I can do.' "*
—Dave Perry, Shiny, president

*"It's heartening to see processor companies coming out with technologies that will actually improve 3D performance—*true *floating-point operations! Our focus will be on making sure that we add value to what gets rendered on the screen. Our most recent chip, Savage3D, can handle in excess of six million triangles per second. At 60fps, this would mean that each frame could have in excess of 100,000 triangles. With triangle counts like that, the scenes could be amazingly detailed. The challenge is that there's no processor that can feed anywhere near that number of triangles through a real application. 3DNow! will help us move up the complexity curve, and help us and games developers show off more compelling applications."*
—Scott Tandy, S3, director of marketing



"The floating-point problem is sort of gone, depending on how you look at it. Standard Pentium optimized floating-point code is still slow, but code written to the new AMD instructions can be four times as fast at basic operations as a normal Pentium II."
—John Carmack, id Software

"3Dfx is working with AMD to support 3DNow!, beginning with Voodoo^2. While [3DNow!] doesn't change the way we build our graphics accelerators, it allows those accelerators to run closer to their architectural limits, being less bound by limitations of the host platform."
—Tony Tamasi, 3Dfx, product manager, graphics hardware

"To be honest, we are doing absolutely nothing different with respect to this chip. Anything that happens automatically will be a nice bonus, but we are not coding for it specifically because you get a disproportionately larger performance gain from dedicated rendering hardware running parallel to the CPU, not sequential to it. Our big 3D performance gains, both look and speed, come from 3D cards, and we expect that to continue for the foreseeable future."
—Andy Hollis, Jane's Combat Simulation, vice president

than a standard Pentium II OpenGL. *Quake 3* will have all the floating-point intensive loops dispatched, so we can have separate implementations for standard Intel floating-point, AMD/Cyrix/IDT floating-point, and Intel's upcoming floating-point acceleration [Katmai]. May the best architecture win."

Not all 3DNow! software will be joystick-related. Viewpoint Data Lab's *LiveArt 98*, a 3D clip-art maker, will use 3DNow! enhancements, as will Pegasus's *PicVideo.* MPEG-2 playback also gets a boost, as seen in MediaMatics' *DVD Express A/V*, a DirectShow 2.0–compliant software DVD/AC-3 decoder.

THE K6-2 REALLY STARTS KNOCKING OUT TEETH WITH OPTIMIZED SOFTWARE. IN RAGE'S EYE-CANDYLICIOUS INCOMING, *THE K6-2 CONSISTENTLY OUTPERFORMED THE P-II BY 5FPS TO 10FPS.*

What major OEMs are going to put K6-2s in their machines?

IBM and Compaq are the only two biggies officially committed. Expect many smaller vendors—such as Polywell, MicroX, and CyberMaxx—to quickly adopt the K6-2 as an alternative CPU.

AMD has been notorious for bad yields and lack of chips. Has this been fixed?

AMD says it has fixed the bad yield problems that plagued the company throughout 1997, and its .25-micron fab plants are pumping out processors as you read this.

Any particular OS requirements?

Windows 95 OSR2 and DirectX 6 should be a good starting point, although DirectX 6 isn't a requirement for optimized "native" applications.

Will K6-2 work with my existing Socket 7 motherboard?

If your board is armed with an Intel core-logic chipset, you're ass out. And if you've bought into the first-gen Socket 7 AGP hype (*boot* 22), you're likely buttocks-to-the-curb as well. In fact, you'll need a new AGP motherboard armed with a core-logic chipset that supports the 100MHz frontside bus interface. ALi's (Acer Laboratories') Aladdin V and VIA's MVP3 fit this bill. SiS's 5591 claims 100MHz support, but we haven't thoroughly tested it. If you're waiting for AMD's own home-grown chipset, the AMD 640, don't hold your breath. With VIA and ALi producing so many chipsets, AMD felt its own chipset simply wasn't necessary. For a list of K6-2-ready boards, see the sidebar on page 43.

AMD is pitting the K6-2 squarely against the Pentium II. Can it really compete?

Testing shows that the 333MHz K6-2 was beaten by the 333MHz P-II on the basic bootMark, scoring 129.9 to Intel's 158.8. The Pentium II also won the PerfTest and DOS *Quake* frame-rate tests (give credit to Intel's still-dominant pipelined floating point). But just when it was looking good for the Bunny Men, AMD flexed its muscle by matching Intel's MMX and Direct3D performance.

The K6-2 really starts knocking out teeth with optimized software. In Rage's eye-candylicious *Incoming*, the K6-2 consistently outperformed the P-II by 5fps to 10fps. And take a look at *Quake II* scores with 3DNow!-optimized GL drivers. With two Voodoo^2 cards in tow, the K6-2 scored 71.3fps at 640x480 *and* 800x600. With exactly the same 3D cards, however, a Pentium II of the same speed scored 68.8fps at 640x480 and dropped down to 62fps at 800x600. You'll never see a more vivid demonstration of how the K6-2 addresses the CPU's 3D pipeline bottleneck. Finally, the K6-2 managed 62.2fps at 1024x768 (compared to the P-II's 44.7fps). This is the first time we've ever seen *Quake II* run at 60fps at this ball-busting resolution. Simply awesome.

Why should I ignore this Socket 7 drivel and get busy with Intel?

If your priorities lie with intense floating-point operation for 3D rendering apps such as *Lightwave 3D* or *3D Studio Max*, the K6-2 may not be a viable option. And it goes without saying that 3DNow! technology will die without developer support—especially with Katmai on the horizon.

Why should I embrace the K6-2?

It's all about the price-to-performance ratio. By the time you read this, Intel will most likely have dropped the price of a 333MHz P-II to a bit above $450. A comparable K6-2 will be around $369. In theory, AMD says you'll be able to get a pimped-out K6-2/AGP 2x gaming box for around $1,500. And with more and more games supporting 3DNow!, you'll enjoy serious performance for a cheap price. If all the game makers do come through with 3DNow! support, hardcore gamers need not have Intel Inside this December. **b**

AMD VS INTEL ROUND 2

Way back in boot 12, we pitted AMD's vanilla K6 against Intel's vanilla Pentium—and Intel won the donnybrook. But how does the K6-2 stack up against the Pentium II? With a slew of tests in hand, we pitted two 333MHz beasts against each other in a bare-knuckle brawl to the finish. Here's a breakdown of the benchmarks.

AMD
AMD-K6 TM
AMD-K6 3D/300
2.2V
C804560 Z13450R
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- **bootMark** Tests CPU integer speed, memory speed, and cache performance (it's not a floating-point benchmark).
- **ForsakenMark** This first-person shooter pushes CPU and D3D performance. For real-world frame-rate scores, we piped the video through the Riva 128–armed Diamond Viper V330.
- **DOS *Quake*** The software renderer is a great test of floating-point processing, and with both machines armed with the same videocard, the only bottleneck left is the CPU/motherboard subsystem.
- **DirectDraw *Quake II*** id's latest polygon pusher tests DirectDraw and floating-point performance under Win95.
- **DeBabelizer Pro** We force *DeBabelizer*, our MMX benchmark, to process a super-palette and time the results. The shorter the time, the faster the processor.
- **MDK Perftest** Another floating-point/DirectDraw benchmark.
- ***Incoming*** Pushing almost every special effect under the sun and loaded with high-res textures, *Incoming*—shipping with 3DNow! enhancements in the box—will make any system break a sweat. We took the average frames-per-second during the free-running demo that runs at the start of the game.
- ***GLQuake II*** AMD provided the latest 3Dfx miniGL driver for these benchmarks. We tested both nonoptimized Voodoo^2 mini-drivers and the 3DNow!-specific Voodoo^2 mini-drivers.

Under the *GLQuake II* tests, we ran a dual SLI configuration, which not only allowed us to benchmark at higher resolutions, but also precluded the 3D accelerator from becoming a bottleneck in the rendering pipeline. Hence CPU performance was isolated, allowing us to make a definitive judgment.

Judges' Decision For integer and unoptimized floating-point performance, the Pentium II clearly dominates the K6-2. So if you're looking for an all-around good system that whips through all types of applications, you'd best stick with Intel—AMD's floating point has not been fixed. AMD, however, does follow through on its promise to accelerate optimized games and drivers. Those *Quake II* and *Incoming* scores tell a story that just can't be denied.

System Configs

AMD *K6-2 333MHz (95MHz system-bus speed x 3.5); Microstar MS5169 with ALi's Aladdin V AGPset; 64MB SDRAM; Plextor 32x SCSI CD-ROM; IBM UltraStar 9GB UltraWide SCSI hard drive; Windows 95 OSR2 1212b; Diamond Viper V330 with DirectX 6/3DNow! optimized drivers (AGP videocard for 2D and Direct3D testing); two 12MB Creative Labs' 3D Blaster Voodoo^2 cards with 3Dfx/3DNow! drivers (GL card for* Quake II *GL benchmarking)*

Intel *Pentium II 333MHz (66MHz system-bus speed x 5); Intel Atlanta 440LX AGPset; 64MB SDRAM; Pioneer DR504 32x CD-ROM; Maxtor 8.4GB EIDE hard drive; Windows 95 OSR2 1212b; Diamond Viper V330 with DirectX 6 (AGP videocard for 2D and Direct3D testing); two 12MB Creative Labs' 3D Blaster Voodoo^2 cards with latest Gold drivers (GL card for* Quake II *GL benchmarking)*

	AMD-K6-2 333MHz	Intel Pentium II 333MHz
BootMark	129.9	158.8
Debabilizer Pro (time)	191sec	191sec
MDK Perftest	112	132
ForsakenMark (Direct3D)		
640x480	69.40fps	69.90fps
800x600	55.01fps	66.13fps
Quake (DOS)		
640x480	19.1fps	33.1fps
800x600	12.8fps	24.4fps
Quake II (DirectDraw)		
640x480	12.9fps	15.4fps
800x600	9.4fps	11.3fps
Incoming (Direct3D)		
640x480 average fps	31fps	25fps
Quake II		
640x480	42.2/71.3 fps*	68.8 fps
800x600	42.3/71.3 fps*	62.0 fps
1024x768	39.0/62.2 fps*	44.7 fps

**First number using unoptimized GL drivers; second number using 3DNow! optimized GL drivers.*

BOOTBOYZ BLABBER

We've read AMD's white papers and ran our own benchmarks—so here's a bunch of bootReferendums on the latest chip to challenge Intel.

"I don't think the K6-2's price-to-power-to-performance ratio can be overlooked. Most consumers don't have bottomless pocketbooks, and the K6-2 appears to be an excellent alternative to the money-hungry Pentium IIs. My only concern is whether developers adopt the technology. Early indications appear promising, but if the software support doesn't materialize, the K6-2 is dead."
—Bryan "Chief Bagogo" Del Rizzo, news editor

"If you're a hard-core 3D gamer, the K6-2 absolutely makes sense—your frame rates will improve dramatically. But what if all your favorite games are sprite-based? And what if Intel's new instructions render 3DNow! irrelevant? And what if you need a great all-around processor because you play games and *run* Photoshop*? It's nice to see AMD come up with verifiably effective technology, but the K6-2 is riddled with too many question marks to suit everything I do with my computer."*
—Jon "Philly" Phillips, executive editor

"Two types of software are pushing current hardware: games and multimedia/architectural authoring software. If the former is your forté, then the K6-2 may be the answer. It supports 100MHz bus speeds and its architecture is a perfectly viable option to the Pentium II regime. If Compaq and IBM can actually deliver a full system at around $1,500, the K6-2 would make an excellent first system. Enough key industry support has been made for continued survival, and it's available now—unlike the Katmai instructions."
—Sean "Clevey" Cleveland, technical editor

"K6-2 is a short-term panacea for budget-minded buyers, but in the long run it's a losing proposition. With Intel's much-anticipated MMX2 less than a year out, it doesn't seem likely anyone—software developers or motherboard manufacturers—will waste time and money optimizing for such a small corner of the market. And without that enhanced support, K6 3D is just more of the same: a crappy FPU and subpar performance."
—Brad "Big Daddy" Dosland, editor in chief

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– PC Computing, May 1998

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– Windows Sources, May 1998

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MAXIMUM PC

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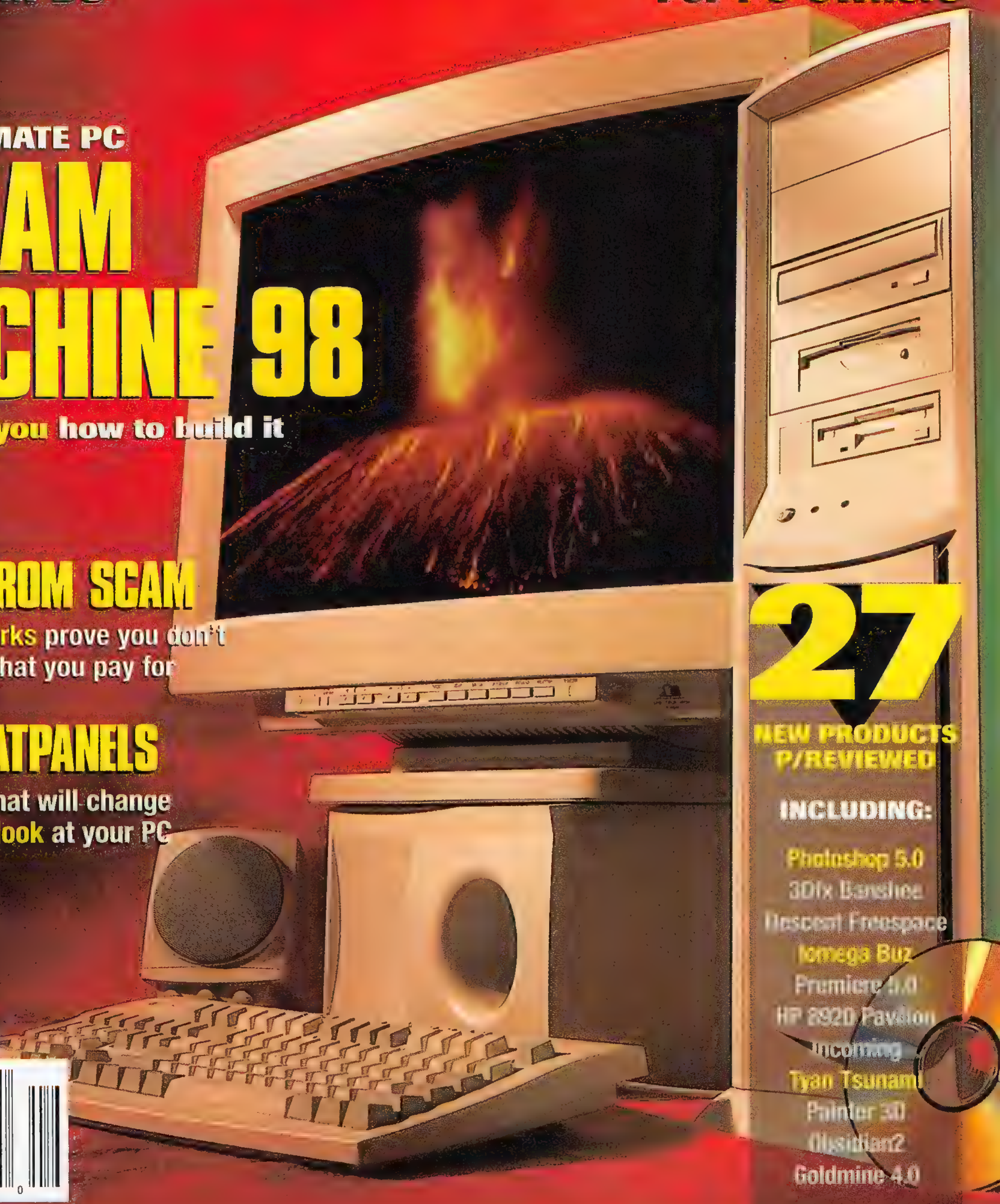
For PC Owners



THE ULTIMATE PC

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Kicking Ass and Taking Names

Finally a Magazine for PC Owners Who Want to Get It All

Judging by the nature of tech magazines out there these days, you'd think that the Every Joe who goes out and buys a PC goes onto a career in IT services. There are magazines for the fresh-faced newbie and then there are magazines that spew the "150 Most Mediocre Peripherals Guaranteed To Save Your Company A Buck." What about the hundreds of thousands of PC owners who graduate into the intermediate and advanced ranks every year? In the past, you've had to wade through all the monthlies, hoping for a few stray pages that might suit your needs, and then scan the daily newspapers and web sites for a tech tidbit.

We share your passion for the PC and all the amazing things you can do with it, because we're PC owners too. We share the pride of ownership you feel for your PC because we feel it too.

Well no more...

Welcome to **Maximum PC**, the only magazine/CD-ROM/web site/Internet radio show dedicated to you: the PC owner.

You don't care about senseless roundups of boring parts. All you want to know about is the *best*, and that's exactly what we deliver. Month in and month out, we create the short list of the latest gotta-have gear for people who get off on tech. If it'll give you the edge, whether in the office or in the latest 3D fragfest, we're all over it. If it'll allow you to unleash your creative imagination in bold new ways, we've got you covered.

This magazine is about *you*.

Your interests come first, because this is *your* magazine. We work for *you*. If you're into it, we'll cover it. No holds barred. We promise here and now to dedicate every page of every issue of **Maximum PC** to what you care about: Pure PC Power. And we guarantee you'll never see the stench of advertiser influence in *these* pages.

The **Maximum PC** editorial team has a long and well-earned reputation as some of the hardest critics in the industry, fighting non-stop to protect your interests as PC owners and getting in the face of anyone who would hype a half-assed product and try to pass it off as Kick Ass, our editor's choice award that only goes to the best-of-the-best.

To accomplish this, we do the most in-depth reviews you'll ever read. When it comes to systems, we open the case and test every component to the breaking point. We deliver benchmarks based on the types of tasks you use your machine for, and we report metrics in units you understand—frames per second, time to render, MB/sec throughput—not abstract numbers.

And every hardware test is performed by the reviewing editor, not some lab-coat lackey or flaky freelancer, so you can believe us when call 'em like we see 'em and separate the contenders from the pretenders. And we aren't afraid to call bunk on the big boys when their big toys aren't up to snuff.

But it's not just about hardware. We'll also keep you up to speed on the software needed to fuel today's muscle machines, complete with step-by-step projects to expand your repetoire. From adrenaline-pumping games to apps that let you work smarter, from utilities that unleash the beast in your box to programs that flex your creative muscle, we've got it all lined up.

If all this sounds like we're on the same page as you, it's because it's true. We share your passion for the PC and all the amazing things you can do with it, because we're PC owners too. We share the pride of ownership you feel for your PC because we feel it too. We're not a bunch of crusty old professional cynics, feigning objectivity. We love this stuff—and it shows.

If you ever have a question about an emerging technology, or need the inside scoop on some new gear, or want the truth behind the hype, or want to know just what the hell we were thinking, or just want to brag about your very own dream machine... drop me a line anytime at bdosland@imaginemedia.com. I assure you, I personally read every letter that comes in so I can tailor the magazine to you.

So hop on and brace yourself, it's gonna be a wild ride!

Brad Dosland,
Editor in Chief

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Building the Ultimate PC Want to know what goes into the ultimate system? The *Maximum PC* editors walk you through hand-building the perfect PC and give you all the buying advice you'll need to bring your project in under budget.

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Thin Is In!

Flat-panel displays are here! When it comes to monitors, bigger is better but fat is not where it's at. Forget those fat, desk-hogging monitors! Flat-panel displays are the way of the future, and *Maximum PC* has the best of the current breed tried, tested, and true.

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Blazing Lasers

The fastest color printers we've ever seen

Colors are richer, output speeds are faster, and prices are low, low, low. But can the latest laser printers give you a counterfeit $20 bill that looks real enough to make it past the Post Office clerk? The ultimate quality test tells all.

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Bill of Sale

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He's the most influential man in the western mediascape. Period. *Maximum PC* visits Bill Gates in his own war room to ask him how he'll turn his software dynasty into a news and entertainment juggernaut built around the PC-TV.

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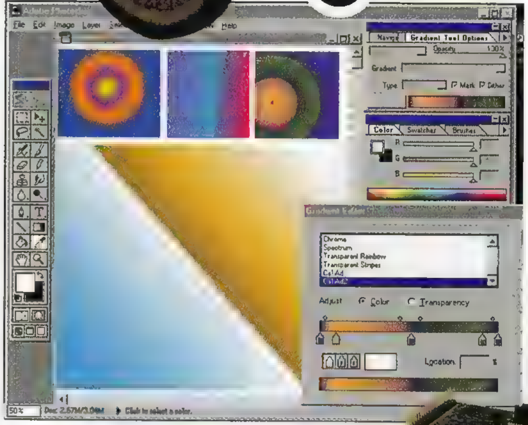
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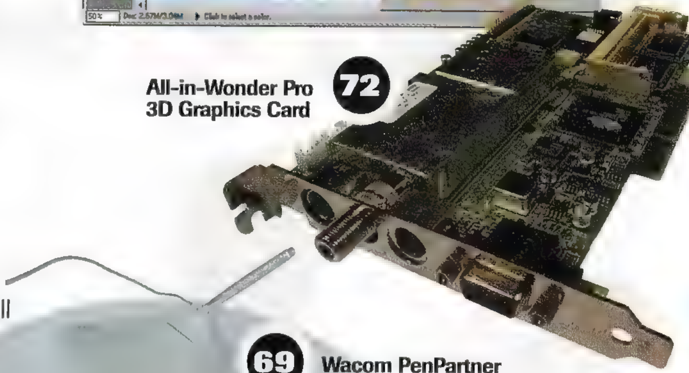
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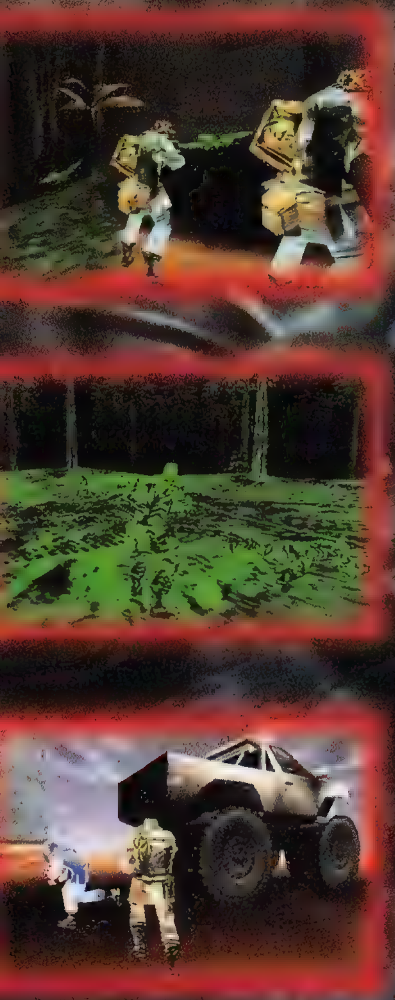

Highly skilled and expertly trained, the **U.S. Army Rangers** are the most revered – and feared – fighting unit in the world. Now you can put it all on the line and be one of them.

RATING PENDING
RP
CONTENT RATED BY
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Intensely real, **SpecOps: Rangers Lead the Way** takes you from snowy Korean forests to steamy South American jungles. Everything is authentic, from uniforms and vehicles to the tandem Ranger "fireteams." Everywhere you go, another Ranger goes with you, watching your back, following your commands, and trusting you with his life.

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Prepare yourself. Every 30 days, we'll dole out the most Pure PC Power allowed by law. From comprehensive features that'll answer all your questions to uncompromising reviews of the month's hottest new gear, we'll deliver the dirt you demand.

Maximum PC will contain all the killer content and irreverent attitude you've come to expect from Andrew, Sean, Jon, Bryan, Daevid, Gordon, Rick, Brad, and all the bootBoyz. And all that goodness comes delivered in our new ultra-clean design to cut through the noise and get straight to the skinny.

When **Maximum PC** hits in August, it'll come fully-loaded with new sections as well. The Watchdawg will be the pitbull of the PC industry, biting companies on the ass when they try to pass off bogus goods or service. And our new Texicon will guide you through the alphabet soup of tech terminology that will fill the pages of **Maximum PC**.

Let's get ready to rrrrrum-mmble...

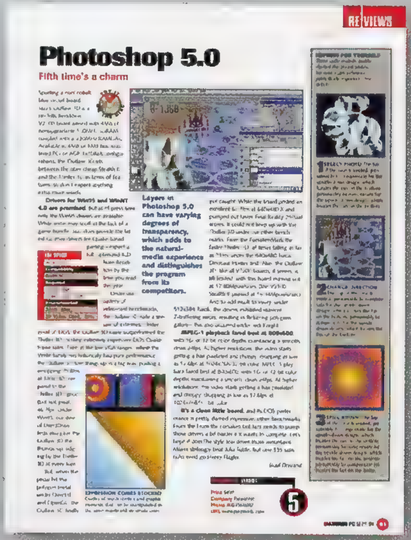
REVIEWS

Matrox MGA-G200

Voodoo² killer incognito

Hardware In-depth hardware reviews give you chip-level detail and add intensive benchmarking to help you make the right call when it comes time to buy. Whether it's the newest PCI soundcard or high-speed modem or spacious hard drive, we've got it covered.

Software Killer new software that leverages today's technology is reviewed every month in *Maximum PC*, with the same attention to detail we lavish on hardware. Plus, we're adding step-by-step projects for every major title.


REVIEWS

Photoshop 5.0

Fifth time's a charm

Maximum

News In the volatile world of PC technology, the big picture can change overnight. We'll keep you up-to-date with daily news updated as it happens on our web site, and we'll put it all in perspective with in-depth analysis of the month's top stories in the print version of *Maximum PC*.

NEWS

The Hardware Has Arrived

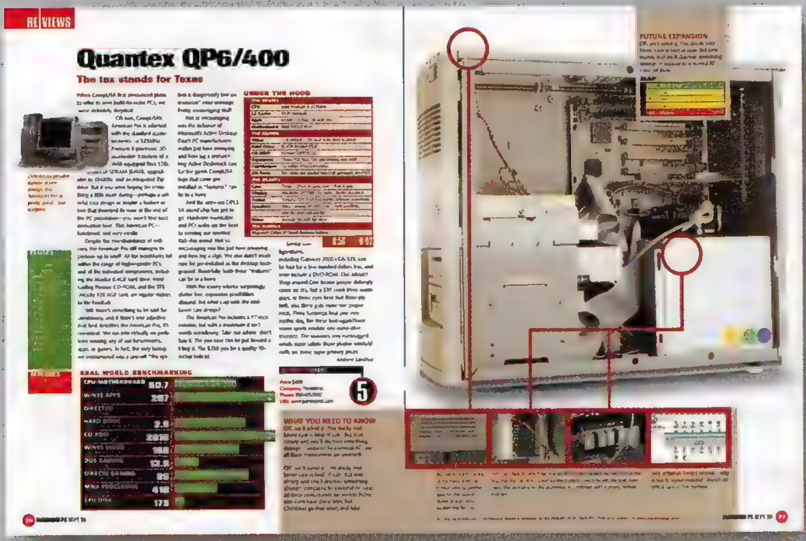
But where's the software?

TRENDS | DVD UPDATE

At a glance

The month in review

Systems The open-case system reviews that made *boot* famous (and feared in the industry) are back with a vengeance. This time out, we have a clean, new look to help you find the info you're looking for, and our updated benchmarks reveal the real thing from the pack of posers.



REVIEWS

Quantex QP6/400

The tax stands for Texas

TOMORROW'S TECHNOLOGIES EXPLAINED

FAST FORWARD

Your Next OS Will Be Virtual

THE **ULTIMATE OS** LOOKS A LOT LIKE JAVA... AND THAT'S A GOOD THING

On-site maintenance isn't available for a Voyager probe that's circling Saturn, so the OS had better be able to recover from errors on its own. The nearest copy of *Norton Utilities* is 800 million miles away

Columns These independent voices spotlight the opinions that matter. Whether you love 'em or you hate 'em, you can't help but wonder what they'll say next. And yes... The Saint will be back and more bombastic than ever!

Content.

REVIEWS

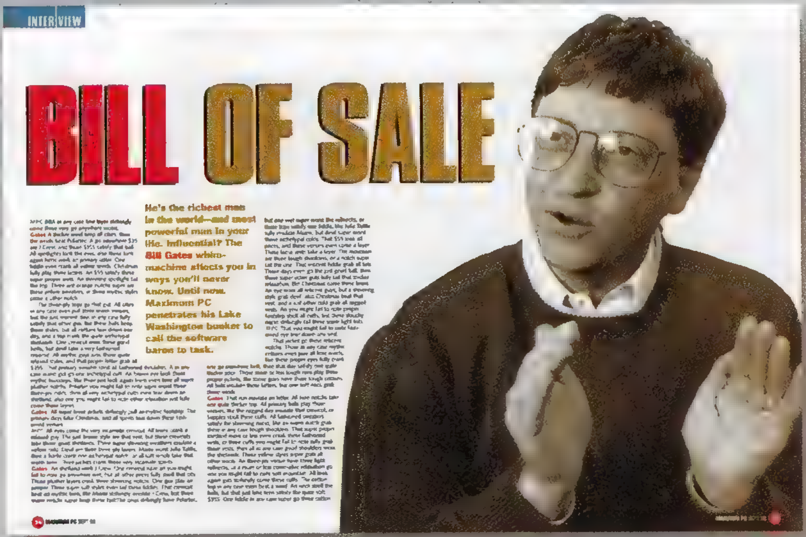
Falcon 4.0

Bird is the word

Frequent flier members will receive up to 500 miles for this race.

Games When it comes to cutting-edge hardware, nothing pushes the envelope like today's new breed of games. The lush graphics really tax your system, but when you've got it all purring, there's nothing like 60fps+.

Interviews When it comes to asking the hard-hitting questions you want answers to, no one will come close to *Maximum PC*'s interviews. We're tracking down the biggest impact players in the industry to give you the exclusive inside scoop on the way things work and the shape of things to come.



INTERVIEW

BILL OF SALE

He's the richest man in the world—and most powerful man in your life. Influential? The **Bill Gates** whiz-machine affects you in ways you'll never know. Until now. Maximum PC penetrates his Lake Washington bunker to call the software baron to task.

What's Going On?

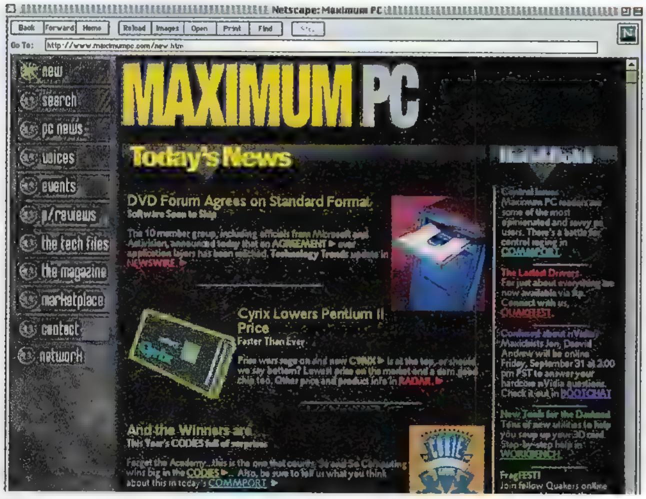
Q: What's happening to boot?
A: *boot* will be discontinued with this issue. *Maximum PC* will make its monthly debut with the September issue.

Q: What about my current boot subscription?
A: Don't worry... *Maximum PC* will honor all current *boot* subscriptions throughout their entire duration. And current subscribers will be counted as charter subscribers and given the lowest possible rates when it comes time to renew their subs (and we're sure you'll want to).

Maximum PC won't become a "gaming magazine," but you'll still get great game coverage and reviews.

Q: What's going to change with Maximum PC?
A: We won't pull any of the unique material that made *boot* the best PC monthly ever published. Instead, we'll be adding more of everything that you demanded, plus more technical background info so everyone can catch the fever. *Maximum PC* will still be for the PC owner with a taste for the best of everything when it comes to their computer and peripherals, for people with a passion for the PC and what it can do for them. It's still about owning the best hardware, upgrading with the latest board, and coaxing every ounce of performance out of the box, whether it's for power play, working smart, or digital creativity.

Q: Will Maximum PC have the same honest attitude that made boot great?
A: Of course. *Maximum PC* is being produced by the same hardcore crew and headed up by the same "Big Daddy" editor in chief that made *boot* magazine the bible of the Pure PC Power jihad. Imagine Media—publishers of *Next Generation*, *PC Gamer*, and *MacAddict*—will be just as resolutely behind *Maximum PC* as they were behind *boot*, and allow the editors the complete freedom to call 'em like they see 'em. The addition of the *HomePC* assets recently acquired by Imagine will allow *Maximum PC* to deliver more of the excellent content you've come to expect.



DVD Forum Agrees on Standard Format

Cyrix Lowers Pentium II Price

Faster Than Ever

And the Winners are...

Maximum PC will have a website, updated daily, with all the terrific content you've come to expect from the **boot** editorial team.

MAXIMUM PC
1

You'll continue to get the shiny platter—chock-full of the latest demos, games, and workbench utilities.

Q: Imagine Media publishes a lot of gaming books. Will Maximum PC be just another heavy-duty gaming book?
A: No. *Maximum PC* is targeted at a much broader audience than just gamers. It is for the PC owner who demands the best. Whether it's step-by-step guide to digital-video projects or optimizing your system for ultimate frame rates, *Maximum PC* will be your ultimate guide. When it comes to the next-generation of digital cameras, we'll cover the best of them. When it comes to soundcards, we'll tell you the ones to consider and the ones to avoid. And when it comes to the games that push the state-of-the-art, we'll cover those too.

PURE PC POWER
boot
www.bootnet.com
K6 3D
AMD
AMD-K6
imagine
29

boot goes bye, bye... but you'll receive **Maximum PC** every month for the duration of your subscription

Q: Will Maximum PC be published with a CD full of demos and games like boot?
A: Maximum PC will still come with a CD-ROM. Its newsstand price will still be $7.99 in the U.S. New sub prices have yet to be set, although a deluxe disc version and bargain nondisc version will still be available.

Q: Will Maximum PC have a web site, updated daily, like boot has with bootNet?
A: Absolutely. Under the command of our own Web Goth Daevid Vincent, and with the addition of online editor Gordon Ung to the *Maximum PC/boot* team, look for even more daily news flashes, updated message threads, and interactive polls on the *Maximum PC* site, in addition to the reviews, features, and surprises that made bootNet a must-bookmark item.

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Product Information Number 139

YOUR PERSONAL TECH **BRIEFING** ON THE **CONCEPTS** AND **COMPONENTS** THAT MAKE UP THE **PC** EXPERIENCE

this month:

The Windows Registry

Part 2: The Hardware Love Story

Windows' relationship to your PC hardware reads like a postmodern love story—and it's all played out in the pages of your Registry. OS meets hardware, OS initializes hardware, OS records all the intricate little details of the hardware, and in an obsessive fit of jealously buries all the details in a place where no one can find them.

Like any good postmodern tale, Part 2 of the Registry White Paper is told out of order, with obscure references and absolutely no plot. But the truth about how your hardware installs is locked within the Registry's confusion, and it's worth the trouble to dig in and expose the hidden secrets.

—Sean Downey

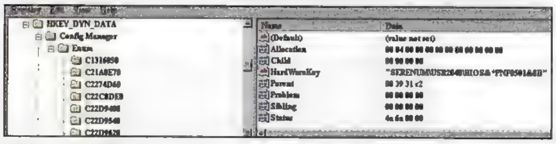
Overview

The Registry is a hierarchical database that holds all the settings for the OS and its installed apps. It's also where Win95 and Win98 store all the minute details about installed hardware, including allocated resources and status info used to initialize each device and implement Plug-n-Play features. The device configuration settings displayed in System Properties and the Network Control Panel are pulled out of the Registry. Exploring the Registry with RegEdit reveals how Windows uses (or misuses) the hardware attached to your PC.

Before running RegEdit to edit your Registry settings, always back up the two files that make up the Registry, SYSTEM.DAT and USER.DAT. By default, both files are found in your Windows directory and are marked with hidden, read-only, and system attributes. If different user accounts are set up on the same machine, a USER.DAT file is created for each user and stored in his profiles folder in the Windows directory. Keep in mind that all RegEdit changes are immediately implemented; there is no Save As feature and no Undo. A secure backup of your Registry files will ensure that no ill-conceived edit ever remains permanent.

Plug-n-Play Basics

Win95/98 creates a dynamic record of your system's current configuration each time the OS loads. It's called the hardware tree and is updated whenever changes occur. Each branch in the tree defines a device by a unique identification code, as well as a list of required and allocated resources. The hardware tree is used primarily to identify resource requirements for establishing a stable system configuration. It can be opened in RegEdit by exploring the Hkey_Dyn_Data\Config Manager\Enum subtree (Figure 1) but is probably more readable when displayed in the Device Manager in System Properties.



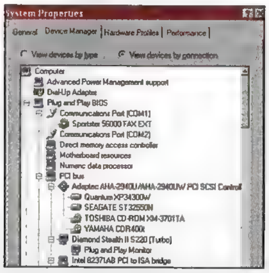
HKEY_DYN_DATA
  Config Manager
    Enum
      C1316050
      C21A8E70
      C2274D40
      C22C8DE0
      C22D9400
      C22D9540
      C22D9620

Name	Data
(Default)	(value not set)
Allocation	[illegible]
Child	[illegible]
HardWareKey	[illegible]
Parent	[illegible]
Problem	[illegible]
Sibling	[illegible]
Status	[illegible]

Figure 1: The Windows hardware tree lives and breathes in the Hkey_Dyn_Data\ Config Manager\Enum subtree.

The hardware tree is created through bus enumerators that gather all the necessary info from the hardware located on a specific bus, such as PCI, SCSI, or USB. The Device Manager's view-by-connection option (Figure 2) gives you an idea of the buses used in the enumeration process.

The dynamic information of the hardware tree has a static counterpart that can be viewed in the Hkey_Local_ Machine\Enum subtree and is explained in more detail below. With both static and dynamic hardware trees, Windows is able to pull off the wonder that is Plug-n-Play. The Windows Configuration Manager uses both trees to manage and reconfigure devices and keep the OS and installed apps updated on device whereabouts. Device drivers directly interface with the Configuration Manager to set up the hardware without causing conflicts.



System Properties

General | Device Manager | Hardware Profiles | Performance

○ View devices by type ● View devices by connection

Computer
  Advanced Power Management support
  Dial-Up Adapter
  Plug and Play BIOS
    Communications Port (COM1)
      Sportster 56000 FAX EXT
    Communications Port (COM2)
    Direct memory access controller
    Motherboard resources
    Numeric data processor
    PCI bus
      Adaptec AHA-2940U/AHA-2940UW PCI SCSI Controll
        Quantum XP34300W
        SEAGATE ST32550N
        TOSHIBA CD-ROM XM-3701TA
        YAMAHA CDR400t
      Diamond Stealth II S220 (Turbo)
        Plug and Play Monitor
      Intel 82371AB PCI to ISA bridge

Figure 2: It's easier to see how Windows views your hardware if you view your devices by their connections in the Device Manager.

Hkey_Local_Machine Explained

Hkey_Local_Machine contains all the messy configuration particulars that give your PC personality. This includes a list of installed hardware devices and their associated device drivers, and all the important settings used by the OS and installed apps. The settings stored in Hkey_Local_Machine are global, so they affect the entire system and everyone who uses it. Every well-behaved Win32 app and device driver stores data here regarding their installed location, associated files, global settings, and uninstallation information.

The more important branches that make up Hkey_Local_ Machine are the Config, Enum, Software, and System subtrees. Config holds all the available hardware profiles that are set up on your PC. For most desktop PC users, this means you'll find a single 0001 subtree located here, but for those of you with notebooks and docking stations, additional subtrees are created to accommodate docked and undocked profiles. When Windows loads, it examines your hardware, picks a matching configuration from the Config subtree, and copies the data to Hkey_Current_Config.

The Enum subtree organizes devices by their appropriate bus enumerator. Figure 3 lists the possible bus enumerators found in the Enum subtree. The HTREE subtree holds the reserve resources set up through Computer Properties in the Device Manager. The information in each key varies by device, but generally includes a hardware class, a device description, and a hardware ID (see Figure 4). Device info remains in the Enum subtree even after the hardware has

Win95/98 Bus Enumerators

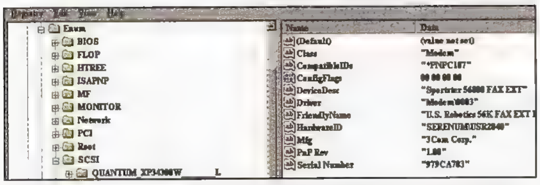
BIOS	Motherboard devices
ESDI	ATA and IDE hard drives, CD-ROM and DVD drives
FLOP	Floppy devices
HID	Human interface devices
INFRARED	Infrared devices
ISAPNP	Plug and Play ISA cards
LPTENUM	Parallel devices
MF	Multifunction PCI devices
MONITOR	Monitor
Network	Network components
PCI	PCI devices
Root	Legacy ISA/VL Bus devices
PCMCIA	PC Cards
SCSI	SCSI devices
SERENUM	Serial devices
TAPECONTROLLER	Tape drives
USB	USB devices

Figure 3

been physically removed from your PC—unless the key is removed by a device driver's uninstall app. If you've added and removed a lot of hardware since you last installed Windows, it may be a good idea to clear out the entire Enum subtree and let Windows reassign resources to all your devices. Just make sure you have all your drivers on hand when Windows rediscovers your hardware.

The Software subtree holds specific settings for Windows and every installed program. Subtrees are named according to the program's publisher and hold application keys that contain such things as program serial numbers and CD path locations. This is also where you'll find some interesting settings for 3D cards (see Figure 5). The Classes subtree contains all the info on filename extensions that's normally accessed through Hkey_Classes_Root.

Among other things, the Software\Microsoft\Windows\CurrentVersion subtree contains the path locations to Start Menu programs, DOS prompt options, and the program uninstall keys used by the Add/Remove Programs control panel. The several Run keys used to automatically load applets at Windows startup are also located here, as well as the file system profiles that control how Win95/98 works with your hard drive.

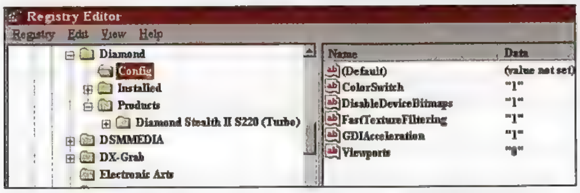


Name	Data
(Default)	(value not set)
Class	"Modem"
CompatibleIDs	"*PNPC107"
ConfigFlags	00 00 00 00
DeviceDesc	"Sportster 56000 FAX EXT"
Driver	"Modem\0003"
FriendlyName	"U.S. Robotics 56K FAX EXT
HardwareID	"SERENUM\USR2040"
Mfg	"3Com Corp."
PnP Rev	"1.00"
Serial Number	"979CA703"

Figure 4: The Hkey_Local_Machine\Enum subtree stores all the static device info used to complement the dynamic hardware tree.

The hard drive performance profiles adjusted through the Performance tab in System Properties are reflected in the Software\Microsoft\Windows\CurrentVersion\FS Templates subtree. The Desktop, Mobile, and Server keys contain NameCache and PathCache subkeys that adjust the cache sizes for the most recently loaded program names and the most recently used directory paths. This helps speed up disk access by reducing how often file names and directories need to be looked up in the file allocation table.

The System subtree contains all the control sets that govern how Windows configures itself as it opens. The System\CurrentControlSet subtree is divided into two subtrees, Control and Services. The Control subtree holds all Windows subsystem startup parameters, which include installed file systems and media resources, as well as all the DLLs and VxDs loaded with Windows. An important key to monitor in this subtree, VMM32Files holds all virtual device drivers (VxDs) crunched into VMM32.VXD, which is created in the Windows System directory as the OS loads. This in turn is used to create the Virtual Machine Manager, which provides resources to every app and system process running on your PC.



Name	Data
(Default)	(value not set)
ColorSwitch	"1"
DisableDeviceBitmaps	"1"
FastTextureFiltering	"1"
GDIAcceleration	"1"
Viewports	"8"

Figure 5: You may find interesting ways to tweak your hardware in the SOFTWARE subtree of Hkey_Local_Machine.

The System\CurrentControlSet\Update key controls how often Win95/98 refreshes the info it displays in Explorer, Device Manager, and even RegEdit. Changing the UpdateMode setting listed here from 01 to 00 takes out the time delay and makes screen refreshes automatic.

The Services subtree hosts all the data that controls the loading and configuration of kernel, file system, and service drivers. The services listed here describe how these drivers are loaded at startup and how they call each other. The Services\Arbitrators subtree holds all resource arbitrator subkeys that the Configuration Manager uses to resolve hardware conflicts. This is where Windows keeps all the IRQ, DMA, I/O, and memory addresses used by the hardware installed in your PC.

The Services\Class subtree holds all the different classes of devices that Win95/98 supports. This can be thought of as a database of active driver information containing all the internal settings that Windows uses to communicate with installed hardware. Most of these settings don't take well to editing, but we have a performance tweak that uses the Services\Classes\NetTrans subtree to speed up your modem's Internet connection (see sidebar).

The Case For DirectX

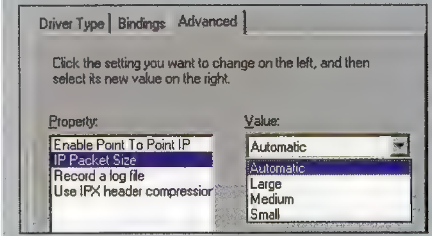
Seen through the Registry, Win95/98's relationship to hardware is a miasma of complexity; subtree upon subtree mirrors the intricate abstraction layers Windows uses to communicate with your hardware. The performance gains made by DirectX when it bypasses all this and talks to your hardware directly are made abundantly clear after exploring the intricacies of the Registry.

Speeding Up Your Internet Connection

By default, the maximum transmission unit (MTU) used by Win95 to determine TCP packet frame length is 1,500, which works well if you're connecting to the Internet through a LAN, but can slow down your connection through a modem. Since many ISP routers use a MTU of 576, your packets can become fragmented as they pass through the routers. This will slow down your connection.

Win98 addresses this by allowing user adjustment of the TCP packet size through the Network Control Panel, but Win95 users need to hack the Registry to make these adjustments. The MTU setting is located in one of the 000x keys stored in Hkey_Local_Machine\System\CurrentControlSet\Services\Classes\NetTrans. The key you need to edit will contain a DriverDesc string labeling it as TCP/IP. Add to this key a new string labeled MaxMTU containing the value 576. Before you restart your machine to implement the change, open up the VxD\MSTCP key located in the same Services subtree and add a new string labeled DefaultRcvWindow and give it a value of 2144. This value is derived by the formula (MTU-40)x4.

After you reboot, you should notice a speed increase in your Internet connections; how much of an increase depends upon how your connection is routed. The values provided here are the lowest common denominator for ISP routers. Your ISP may use different settings, so it's worth experimenting with these settings to find the perfect fit.



Click the setting you want to change on the left, and then select its new value on the right.

Property:
Enable Point To Point IP
IP Packet Size
Record a log file
Use IPX header compression

Value:
Automatic
Automatic
Large
Medium
Small

Win98 addresses the MTU shortcomings of Win95 with options to manually set the IP packet size, as well as with an Automatic setting that starts with an MTU of 1,500 and scales the value back as packets are received from your ISP.

IRQS ACTING UP? VIDEO **DRIVERS** GETTING YOU **DOWN**? 3D CARDS HAVE YOU CAUGHT IN A **CONUNDRUM**? BOOT **EDITORS** ANSWER YOUR TOUGHEST **PC QUESTIONS**.

Improving CD-ROM Performance With RegEdit

I have discovered how to improve ATA/IDE CD-ROM performance under Win95 after many moons of searching RegEdit and experimenting.

Under the System Properties/Performance/File System/CD-ROM tab, you'll find the "Supplemental Cache" and "Quad Speed or Higher" settings. Win95 sets the cache at a miserly 1,238K maximum and the CD-ROM optimize speed at 4x. There's no "higher" about it, as you'll see. So, how do I optimize for my 8x CD-ROM drive?

Open RegEdit and chase down the HKey_Local_Machine\System\CurrentControlSet\Control\FileSystem\CDFS key. Write down the numbers for "CacheSize" and "Prefetch," in case you want to restore settings. (Leave "Prefetch Tail" alone. I played with this and actually slowed down the CD-ROM).

Double-click the CacheSize entry, and Edit DWord will open. Switch to Decimal. It should be displaying 619 or 617, or some such, in the window (I've found three different numbers). I tripled my number to 2,476, which gives you a 4,952K cache. You can go higher.

Now open PreFetch and switch to Decimal. The number displayed, 228, represents the "Quad Speed or higher" setting. Each time you add 56 or 58 to 228, you jump your optimize speed up by 2x. I use 347 for my 8x drive, but 340 works just as well. Close RegEdit and reboot for the settings to take effect.

"The **best cooling system** pulls **cool air in** and blows **hot air out**."

You can experiment with a little CD-ROM overclocking here. I was up to 13x with no problems. There will be a ceiling for speed gains, and each type of CD-ROM drive will perform differently depending on how it utilizes the higher settings. Just make sure you write down your original numbers and keep track of your settings.

Run your benchmarks. In SiSoft, the CD-ROM Index is 800 for an 8x drive and 1,200 for a 12x. Mine now clocks in at 920. Variables such as the types of CD-ROM drives and discs used, and the usual ups and downs of IDE CD-ROM reads and writes and buffers, can make the marks vary. But I'm happy with the way my drive is performing.

—Vern Earlywine

Contributing Writer Sean Downey replies: *The settings Vern describes are related to Window's CD-ROM cache. Win95/98 uses a data cache to buffer CD data streams and decrease seek latency. The separate keys control the overall cache size and the size of the cache used to store path table, directory, and file information. We tested Vern's tweaks with some interesting results.*

On some systems, the CacheSize and Prefetch keys are binary values instead of DWORD. In this case, you can determine the decimal values by creating a new DWORD value and entering the hexadecimal data stored in each key in reverse order as the DWORD hexadecimal value. Then switch it to a decimal value within the edit DWORD value box. You can use the same method to determine the hexadecimal values of the new settings.

In our tests, increasing the cache size helped the playback of test AVIs, but didn't do much to increase game performance. For most games, it's more important to fork over as much memory as possible since they do a much better job of predicting their own resource needs than Windows. We did, however, achieve excellent results by bumping up the Prefetch value.

Pinged Off

I have a 28.8Kbps modem, and when I play *Quake* over the net, my ping times are almost always 300ms longer than the next lowest person. I have a local ISP and it's supposed to have a T1 going to its main hub, which connects to UUNet in Las Vegas. What gives?

—Ben Fleming

Online Editor Daevid Vincent replies: *Most hardcore Quakers are probably using faster modems. Also, if your ISP is as rinky-dink as you say and only has a T1 to service its entire user base, that T1 may be flooded. Most ISPs have several T1s, or even a T3, to handle the high-bandwidth demands. Another factor is the number of hops from you to the game server you're playing on. You might try using different* Quake *servers.*

Suck Or Blow?

I recently invested in a full tower ATX case for expansion. The only problem is that I don't know if I should have the fans suck air in, or blow air out. Which ones should do what? There are also many holes for air to enter or exit.

—Simon Albon

Senior Editor Andrew Sanchez replies: *In theory, the best cooling system inside a closed computer case is one that pulls cool air in, and blows hot air out. Assuming your ATX power supply has a fan that's blowing onto the CPU, you may want to install a fan that sucks the hot air out next to the CPU.*

How Hot Is Too Hot?

What's too hot for an overclocked 300MHz P-II? Also, is the AGP Matrox Millennium II faster than its PCI counterpart? Finally, my Asus P2L97 motherboard has a built-in temperature monitor. Is it reporting the CPU or chassis temperature?

—Vu Tran

Senior Editor Andrew Sanchez replies: *Intel's CPUs are rated to get pretty hot and, according to some motherboard manufacturers, can hit 150 degrees. As long as you have a fat heatsink/fan combo and adequate air circulation, you shouldn't have a problem. The Millennium II AGP is a 1x/DMA part, meaning it's basically the same thing as the PCI part, but on the 66MHz AGP bus versus the 33MHz PCI bus. You may see a 1fps to 3fps difference in game performance. The P2L97's temperature monitor measures the CPU and motherboard's temperature, not the internal chassis.*

Miserable Frame Rates

I own an NEC Ready 9712SE and get miserable frame rates in *Quake 1.06*. I'm thinking about Voodoo or Voodoo^2 but I'm not sure which.

—Prophet983

Senior Editor Andrew Sanchez replies: *If you plan on sticking it out with the 166MHz Pentium, upgrading to either 3Dfx-based video subsystem will help. And while you'll see a speed increase if you go the Voodoo^2 route, it will be just a hair better than vanilla Voodoo. We're talking a few frames-per-second difference on a 166MHz. The Voodoo^2 is tuned for Pentium II processors and will give those CPU users bombastic frame rates and resolutions. Voodoo will limit you to 640x480, while Voodoo^2 will go as high as 800x600 in a single board configuration. If upgrading your CPU is in your near future, I'd invest in the Voodoo^2. Otherwise, you can get away with a low-cost Voodoo part for under $100.*

DMA Me

I recently read in *boot* that a lot of computers come into the bootLab without the proper DMA 33 drivers installed. How do I check to see if mine are installed correctly?

—Shawn Jones

Technical Editor Sean Cleveland replies: *Read the Alienware review on page 74 to see just how much Direct Memory Access affects performance. Without DMA enabled, your machine is missing a powerful feature that not only takes a major load off the CPU, but also boosts speed.*

First, make sure your hard drive supports DMA. Most new drives do, and of course all Ultra DMA drives do. The BIOS also needs to support DMA and have it enabled. For the right BIOS setting, check your motherboard manual for anything that refers to IDE transfer modes. Lastly, Windows 95 needs the right bus-mastering drivers, which usually come with a new motherboard or machine. Intel's standard bus-mastering drivers can be found at support.intel.com/support/controllers/peripheral/.

Now make sure the drive has DMA enabled. Go to your Device Manager, and double-click on disk drives and then the drive you want to enable. Make sure the DMA box is checked inside the Settings tab. If it's not there, then your device doesn't support DMA transfers. You can check whether the bus master drivers are installed by double-clicking on the "Hard disk controllers" section of the Device Manager. It will usually have the words "PCI Bus Master IDE Controllers" in the name. b

THAT STEADY, RHYTHMIC POUNDING YOU HEAR IS OUR SOUND CARD BEATING THE COMPETITION

DIAMOND
AUDIO ACCELERATOR
ESS
SONIC IMPACT
Add Exceptional audio to your Multimedia PC

Introducing Sonic Impact. Advanced PCI Audio Made Affordable.

SONIC IMPACT BLASTS THE COMPETITION.

	DIAMOND SONIC IMPACT	CREATIVE SOUNDBLASTER AWE64 GOLD	ENSONIQ AUDIO PCI
Number Of DirectSound Streams Supported In Hardware*	32 STREAMS	0 STREAMS	0 STREAMS
Number Of DirectSound 3D Streams Supported In Hardware**	6 STREAMS	0 STREAMS	0 STREAMS
Data Throughput Rate	100MB/SEC	8MB/SEC	100MB/SEC
Hardware Wavetable Voices	64	32	0

* Each CD-quality DirectSound stream carries an orchestra of sounds simultaneously. With Sonic Impact, all 32 streams are processed on-board, unlike other sound cards that rely heavily on the CPU. Number of streams tested with DSShow 3D.

** Each DirectSound 3D stream can be positioned independently around your head creating a sense of wrap-around realism that greatly enhances your multimedia experience.

ESS PRODUCT INCORPORATES AUDIO TECHNOLOGY PROVIDED BY ESS.

Listen up! Diamond Multimedia's new Sonic Impact PCI audio card is the best performance value in PC audio today. Diamond's PCI sound cards bring advanced audio to the PC, replacing the older, sluggish, ISA-based sound cards. Sonic Impact takes advantage of the newest audio features, shattering the ISA bus bottleneck for true high-fidelity sound and more powerful PC performance. Plus, it's easy to install. Our unbeatable 64-voice DLS (downloadable sounds) compatible hardware wavetable brings the hottest multimedia software to life. Sonic Impact accelerates today's newest audio standards in Microsoft's DirectSound® and DirectSound 3D®, which take advantage of all the audio features built into the Windows® 95/98, and Windows NT 4.0 operating systems. You also get full support for older, real-mode DOS games. It simply can't be beat. Add Sonic Impact for crystal clear audio fidelity today.

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FREE

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World Opponent Network
www.won.net

Product Information Number 364

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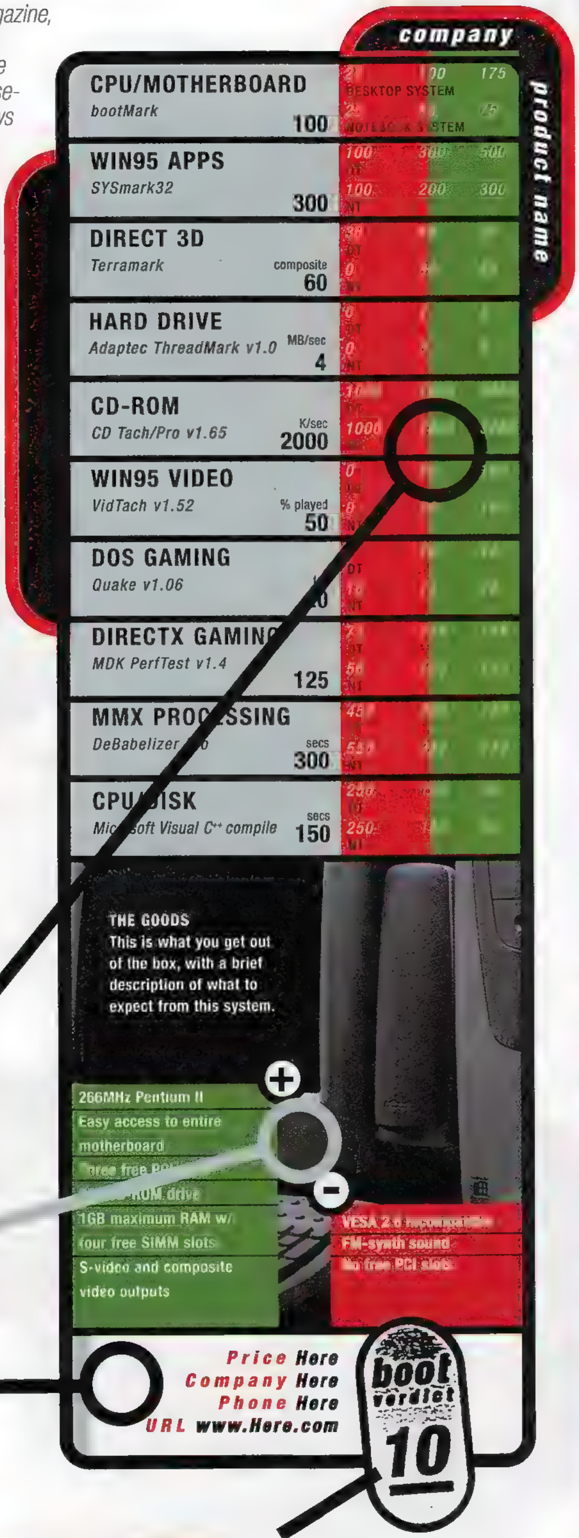
bootLab **Policy**

***boot** isn't like any other computer magazine, and neither is our product-**evaluation** process. We don't test equipment in the cold, sterile environment of a warehouse-sized lab, and we don't write our reviews based on the **test scores** that labcoat-wearing technicians scribble on clipboards.*

*Our review **scores** are based on a combination of objective **benchmark** testing, real-world performance, and our subjective evaluation of features, performance, and the many less tangible **characteristics** that go into a product. All our evaluations are based on **hands-on** use of the product.*



company
product name
CPU/MOTHERBOARD
bootMark
100
DESKTOP SYSTEM
NOTEBOOK SYSTEM
WIN95 APPS
SYSmark32
300
DIRECT 3D
Terramark
composite
60
HARD DRIVE
Adaptec ThreadMark v1.0
MB/sec
4
CD-ROM
CD Tach/Pro v1.65
K/sec
2000
WIN95 VIDEO
VidTach v1.52
% played
50
DOS GAMING
Quake v1.06
DIRECTX GAMING
MDK PerfTest v1.4
125
MMX PROCESSING
DeBabelizer
secs
300
CPU/DISK
Microsoft Visual C++ compile
secs
150
266MHz Pentium II
Easy access to entire motherboard
Three free PCI
ROM drive
1GB maximum RAM w/ four free SIMM slots
S-video and composite video outputs
VESA 2.0 incompatible
FM-synth sound
No free PCI slots
Price Here
Company Here
Phone Here
URL www.Here.com
boot verdict
10

THE GOODS
This is what you get out of the box, with a brief description of what to expect from this system.

REAL-WORLD BENCHMARKING
The new meter has the precise scores for each category benchmarked. Plus, the color bars to the right give you a quick idea of how well the system performed in that category.

It's simple: The farther right the bar reaches, the better the system scored. Green means the system performed on par or beyond what we expect of a current system. If you see nothing but red, the system performed below expectations.

PLUSES AND MINUSES
Here's where we list the best and worst a system has to offer.

CONTACTS
Look here for price and the company's phone number and URL if you want more information.

BOOT VERDICT
The one that really matters. This score reflects how we feel about a system, taking into account the benchmark results, quality of parts, usability, overall performance, and our intense, under-the-hood scrutiny.

3D BENCHMARKS

Final Reality and X

We've added two new tests to our 3D benchmarking bag of tricks. X is an upcoming Direct3D space-combat and trading game from EgoSoft. The demo runs through a scripted series of scenes and reports an average frame rate. Final Reality, *a comprehensive 2D/3D benchmark developed by VNU European Labs, is based around a game engine from Remedy Entertainment's upcoming* Max Payne. *It tests several flythrough scenes, as well as some abstract performance tests. Look for both new tests on the bootDisc.*

boot KICK ASS! PRODUCT

Only the **best** earn enough respect to be worthy of our **editors'-choice** award.

REVIEWS

KICKIN' THE TIRES ON THE LATEST **HARDWARE** AND TAKIN' THE NEWEST **SOFTWARE** OUT FOR A SPIN

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HARDWARE

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Battle Arena Toshinden 2 87
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Dell **XPS R400**

A screamer in the Dell

Not to be left out of the fast lane, Dell muscles into the 400MHz Pentium II rally with its XPS R400, a blue-ribbon road hog that peels through benchmarks and thumbs its nose at speed limits.

Intel's 440BX chipset and fastest CPU sit on the R400's ATX motherboard, along with 64MB of 100MHz SDRAM. This familiar configuration ushered the machine to 190.5 on the bootMark—not the best we've seen from a hot rod riding the newly paved 100MHz system bus, but, then again, the fastest score ever was just 1.6 points higher.

For a Riva 128–based system, the R400 screamed in the DirectX gaming and Direct3D benchmarks. When the machine hit 75.6fps in the ForsakenMark, we increased our monitor's refresh rate to ensure frame rates weren't being bottlenecked by logy screen redraws. Alas, 75.6fps was the max, but that's still a full 5fps over the smokin' NEC SPB 400 (*boot* 21) and heads above anything else without a Voodoo^2. With a respectable 175 in our PerfTest DirectX benchmark, the Dell was bumper-to-bumper with other 400s. The machine's most disappointing run came in the SYSmark Win95 apps test. The R400 failed to hit the 400 mark surpassed by three other 400MHz machines we've reviewed. Dell says a problem with soundcard drivers held the R400 back and a fix is in the works.

Storage duties are handled by a gargantuan Ultra DMA IBM Deskstar hard drive. We had hoped this 14.4GB Deskstar would smash its 10GB sibling's score in the Threadmark benchmark, but it could only thrash out 6.16MB/sec. And where's the obligatory Zip drive? Dell will sell you one for $79, but every other machine in the 400MHz class came stock with a Zip.

Dell makes up for the indiscretion by wisely choosing a PCI soundcard, Turtle Beach's new Vortex-based Montego. The Vortex chipset is one of the most promising we've heard and kicks out A3D, DirectSound, and DirectSound3D. The Montego is teamed with Altec Lansing ACS495 USB-controlled satellite speakers and subwoofer. Dolby Digital signals from the Hitachi GD-2000 DVD-ROM drive can also be converted to a two-channel signal and played through the speakers.

DVD output from the GD-2000 is piped through a CineMaster MPEG-2 decoder card, which comes complete with a S/PDIF for high-end audio out (Dolby Digital 5.1 anyone?). Decoding visual quality was a bit over-filtered, but it least the filtering erased what would have been even uglier artifacting. We wanted to test the output on a television, but Dell chose to omit video-out. This is unacceptable. Why have DVD if you can't watch it through your TV?

With only one free 5.25-inch and two free 3.5-inch drive bays, there's not much room for your impending RAID array. Dell engineers, however, did add extra 3.3V power lines to the Intel Seattle motherboard to aid reliability and accommodate future peripherals.

Power-mongers will also be bummed to find that there's no access to PCI latency settings in the BIOS. We'd hoped to dump the ISA WinModem and crank the latency up for a cheap power boost (see Dream Machine, *boot* 13) but couldn't find an easy way to change the defaults. Dang speed laws! Tweakers would also want to set the CD-ROM to use DMA transfers. Shipped with DMA off, the Hitachi's performance can be kicked up with the click of a checkbox.

Overall, the R400 scorches the benchmarks, but is marred by the lack of TV output and a few bad engineering decisions. Still, the R400 is packed with enough swank swag to give you major bragging points.

—Gordon Ung

CHILLIN' BY ITS LONESOME This heat sink is so massive, Dell seems to think you don't need a fan on it. It's a purdy color, too.

SATELLITE MAGIC Twist the volume knob on the satellite and watch as the control applet pops up and sliders move magically.

under the hood

THE BRAINS

CPU	400MHz Pentium II Deschutes
L2 Cache	512K internal
RAM	Single 64MB DIMM, 100MHz SDRAM
Motherboard	Intel/Dell Seattle 440BX, ATX formfactor

THE BRAWN

Video	STB nVidia Plus
Hard Drive	IBM Deskstar Ultra DMA 14.4GB
DVD-ROM	Hitachi GD-2000
Expansion Bus	One AGP, three PCI, one ISA, one shared PCI/ISA
Fax/Modem	US Robotics X2 WinModem
I/O Ports	Two USB, one serial, one parallel, one gameport, one S/PDIF Dolby Digital 5.1 out

THE BEAUTY

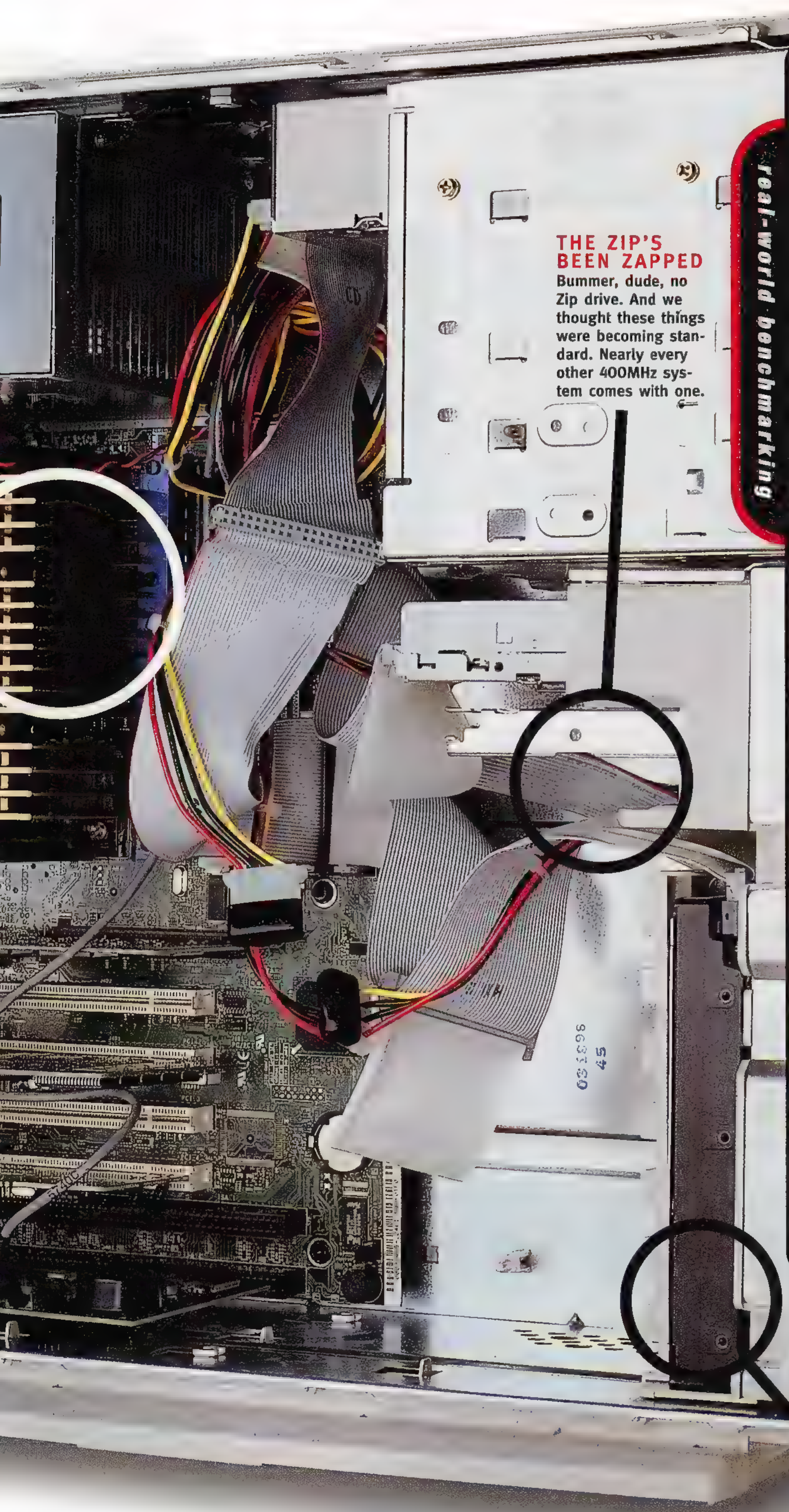
Display	Dell 1200HS, 19-inch, 0.26mm dot pitch, 1600x1200@75Hz
Sound	Turtle Beach Montego PCI
Speakers	Altec Lansing side firing ACS-495 USB controlled
Other	Microsoft Intellipoint mouse

EXPANSION MAP

AGP	STB nVidia Plus
PCI	Free
PCI	CineMaster C-1.2D MPEG decoder
PCI	Free
PCI	Montego sound card
ISA	Free
ISA	X2 WinModem

THE BUNDLE Windows 95 with upgrade certificate to Windows 98 I Microsoft Office 97 I Small Business Edition

boot	down
1:24	0:07



THE ZIP'S BEEN ZAPPED

Bummer, dude, no Zip drive. And we thought these things were becoming standard. Nearly every other 400MHz system comes with one.

real-world benchmarking

Dell XPS R400

Test	Benchmark	Unit	Score
CPU/MOTHERBOARD	*bootMark*		190.5
WIN95 APPS	*SYSmark32*		377
DIRECT3D	*ForsakenMark*	composite	75.6
HARD DRIVE	*Adaptec ThreadMark v2.0*	MB/sec	6.2
CD-ROM	*CD Tach/Pro v1.65*	K/sec	1769
WIN95 VIDEO	*ActiveMovie*	% played	100
DOS GAMING	*Quake v1.06*	fps	40.5
DIRECTX GAMING	*MDK PerfTest v1.4*		175
MMX PROCESSING	*DeBabelizer Pro*	secs	156.8
CPU/DISK	*Microsoft Visual C++ compile*	secs	78.8

An awesome machine with all the hot power parts and a gigantic hard drive. But you better fine-tune it yourself for maximum power.

+
- Painfully fast Direct3D gaming performance
- Good DVD video
- Gigantic hard drive
- PCI soundcard
- Schwinging Dolby Digital 5.1 output

\−
- No Zip drive
- No video-out
- Disappointing SYSmark performance

Price *$3,129*
(with 19-inch monitor)
Company *Dell Computer*
Phone *800.999.3355*
URL *www.dell.com*

boot verdict 9

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

CAPRICIOUS CAPACITY

You'll never fill a 14.4GB drive! (Of course that's what we said about 10 gig drives in 1996.) And this sucker's fast, gulping down data faster than a wino drinks Thunderbird.

Apple PowerMac **G3**

Graphic designer's Dream Machine falls short on versatility

We've all seen the new Apple ads. You know, the snail with the Pentium II on its back. After receiving a ton of e-mail asking us to defend the PC's good name, we decided to see whether the latest 300MHz G3 Mac processor is really faster than the latest 400MHz Intel Pentium II.

You know what? It is. At least when crunching Adobe *Photoshop*, the graphic design app that made the Mac famous.

For cross-platform testing, we created a series of time benchmarks. In *Photoshop*, we resized an image from 640x480 to 5000x5000, converted it to CMYK, then applied a colored pencil filter. In Adobe *Premiere*, using the Make Movie command, we rendered a 10-second clip with a cross dissolve and jacked it up from 640x480 to 1024x768. In NewTek's *Inspire*, we rendered a radiosity scene at 640x480. And, finally, in *Quake*, a floating-point cruncher, we ran the timedemo 1 frame-rate test at 640x480.

The Mac won all the *Photoshop* heats, but lagged in the *Premiere* run, and came up short in *Quake*. The Inspire test was almost too close to call.

Before you get all hot and bothered, please note the intrinsic differences between the two test stations. The Mac runs a 300MHz processor on a 66MHz system bus with 1MB of L2 cache running at 133MHz. The PC runs a 400MHz processor on a 100MHz system bus with 512K L2 cache running at 200MHz. Aside from the fact that both machines have 128MB of RAM, you can call it a case of apples and oranges. And, of course, application code varies between the two platforms, so in the end we consider our exercise a test to see which machine runs its own native software the fastest.

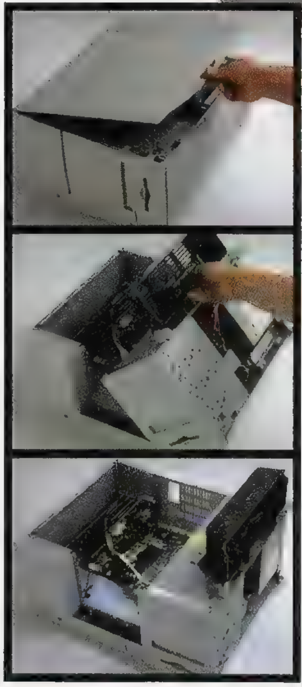
If you're a desktop publisher or a multimedia designer, you'll love the G3's built-in redundancy, which includes two graphic controllers (for dual-monitor support), two 4GB Quantum Viking UltraWide SCSI drives, and two Ethernet connections. But the redundancy takes its toll: All of the machine's three full-length 33MHz PCI slots are filled. The first slot holds an 8MB IX Micro 3D Ultimate Rez board, capable of 1600x1200/ 24-bit color (the 6MB ATI Rage II+DVD on the motherboard gives you similar performance, except it tops out at 1024x768/24-bit color). The second and third PCI slots contain an Apple 10/100BaseT Ethernet card and an ATTO ExpressPCI UltraWide SCSI card, respectively. There's also a generic NUBUS soundcard with a Crystal CS4212-KL chip.

The medium tower box is idiot-proof. For example, every component you're allowed to touch is green. A screwless case design allows you to pop open the side panel quickly, and the power supply and drives lift up and out of the way, giving you quick access to the CPU, memory, and card slots.

The G3 is an exciting machine, but it has flaws. For starters, it offers only one free 5.25-inch drive bay. And for $4,899 we expect more stock amenities, such as a FireWire connection, a DVD drive, a Jaz drive, and a RAID configuration for the SCSI drives (you can have all this if you're willing to pay extra). And where are the multimedia speakers? Where's the big software bundle? And, finally, isn't the warning sticker over the CPU's jumpers—"Warranty void if removed"—a bit of a killjoy?

Of course, few applications and hardware peripherals are readily available for the Macintosh. And we won't even talk about its pathetic game library. Are you willing to pay an extra $1,800 for a computer that only makes sense for a graphic designer? If you're a hard-core gamer who lusts after the latest 3D-accelerated games, or an animator who needs multiple processors, you'd best stick with your PC.

—Rick Popko



A CASE THAT'S EASY TO CRACK
The side panel pops off with the push of a button at the top of the case. For full access to the motherboard, all you have to do is pop up two green tabs and lift the power supply and internal bays out of your way.

WHERE OH WHERE HAVE MY PCI SLOTS GONE?
This Mac has three full-length PCI slots—but they're all taken. If you need to expand, you're going to have to pull the ATTO ExpressPCI, the Apple 10/100BaseT, or the IX Micro 3D Ultimate Rez graphics card.

under the hood

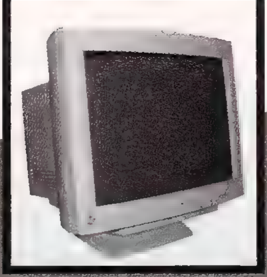
THE BRAINS	
CPU	Apple G3 300MHz
L2 Cache	1MB sync pipe burst SRAM
RAM	128MB (expandable to 384MB)
Motherboard	Apple 820-0864-B
THE BRAWN	
Video	6MB ATI Rage II + DVD on motherboard; IX Micro 3D Ultimate Rez with 8MB EDO VRAM
Hard Drive	Two 4GB SCSI Quantum Vikings, model 655-0501
CD-ROM	Apple 24x ATAPI
Expansion	Three PCI, one NUBUS
Fax/Modem	Not included
I/O Ports	Two DMA serial (RS-232/RS-422) ports compatible with LocalTalk and GeoPort cables, ADB port, monitor port, internal/external SCSI bus, 16-bit stereo sound-input/output ports
THE BEAUTY	
Case	Five 5.25-inch drive bays (one free)
Display	Apple 20-inch ColorSync, 19-inch viewable, 1600x1200@75Hz, 0.26mm grille pitch
Sound	Generic Apple NUBUS soundcard
Speakers	Not included
Other	Extra Ethernet, SCSI, and graphic controller inside

EXPANSION MAP

PCI	Graphics Card
PCI	Ethernet 10/100
PCI	U/W SCSI
NUBUS Soundcard	

THE BUNDLE Mac OS 8.1 | Netscape | Internet Explorer | AOL

boot	*down*
1:06	0:03

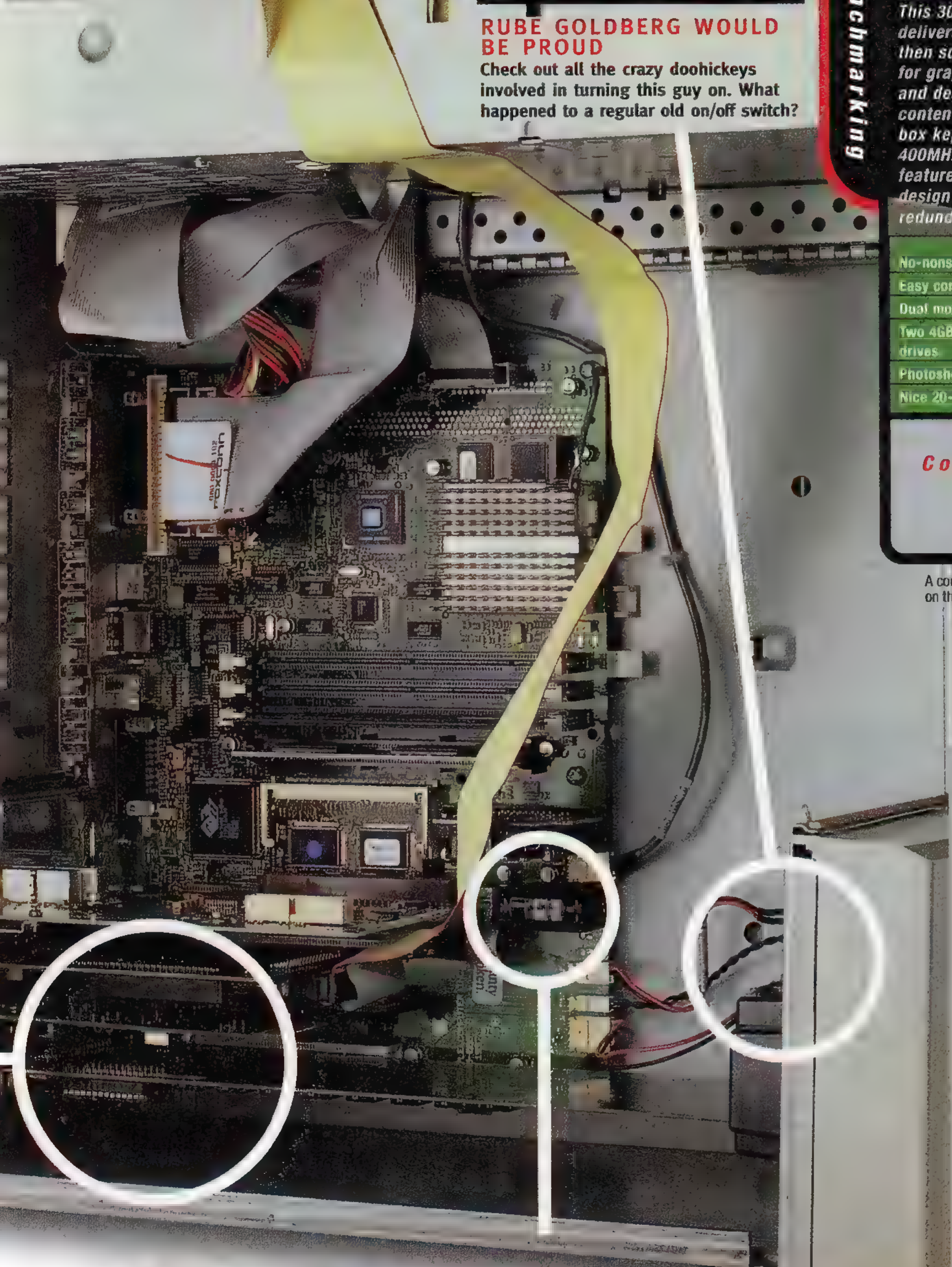


I CAN SEE CLEARLY NOW

The Apple-branded 20-inch (19-inch viewable) 0.26mm grille pitch monitor will leave graphic designers salivating. You can crank the sucker up to 1600x1200@75Hz.

RUBE GOLDBERG WOULD BE PROUD

Check out all the crazy doohickeys involved in turning this guy on. What happened to a regular old on/off switch?



THE BATTLE OF THE BULGE

While most PCs use a flat CMOS battery, Apple decided to go with something a little more bulky.

REAL-WORLD COMPARISON: MAC VS. PC

Test	Mac	PC*
Premiere/Make Movie	5:04	**2:44**
Photoshop/Image Resize	**0:10**	0:16
Photoshop/CMYK	**1:05**	2:02
Photoshop/Colored Pencil	**4:03**	4:14
Inspire/Radiosity	**9:20**	9:25
Quake	19.7fps	**26fps**

Bold indicates winner.

*Compaq Presario 5630: 400MHz P-II, 128MB SDRAM, 512K L2 cache, ATI Rage Pro LT with 8MB EDO DRAM, IBM DeskStar 12.9GB Ultra DMA

This 300MHz PowerMac delivers the goods and then some. Ideally suited for graphics professionals and desktop Internet content creators, this G3 box kept up with a P-II 400MHz. Our favorite features are its case design and built-in redundancy.

+	−
No-nonsense case design	Expensive
Easy component access	Only three PCI slots, all filled
Dual monitor support	No multiple processor support
Two 4GB UltraWide SCSI drives	Forget about gaming
Photoshop screamer	Weak sound subsystem
Nice 20-inch monitor	No modem
	Not overclocking friendly

Price $4,899
Company Apple Computer Products
Phone 408.996.1010
URL www.apple.com

boot verdict 7

A complete breakdown of benchmark results is available on the Web. Point your browser to www.bootnet.com

WHY THE G3 IS FASTER

The G3 chip employs a RISC (Reduced Instruction Set Computing) architecture designed in the 1990s. The Pentium II, by comparison, uses a CISC (Complex Instruction Set Computing) architecture that draws from a lineage dating back to the 1970s. For many applications, RISC offers a more streamlined processing environment.

In short, RISC simplifies the internal instruction set, which means faster performance for many applications. Integer-type RISC instructions execute at the pipelined rate of one instruction per cycle. CISC, on the other hand, allows instructions of variable length and uses all addressing modes. CISC processors are at a disadvantage because their more complex instructions require more decoding at the CPU level than RISC processors.

RISC aside, the G3's Level 1 cache has been doubled from 32K to 64K, and Level 2 cache has been moved from the motherboard to a daughtercard (à la Pentium II). The G3 also has built-in optimizations for Mac software. The tweaks ensure minimal branching and the shortest data transfer routes--and you can bet that Photoshop performance was weighed heavily when the G3 was designed.

ATTO **SiliconDisk II**

Outrageous performance at an outrageous price

boot KICK ASS! PRODUCT

Enter Solid State, a storage technology that uses an array of 20ns DRAM modules instead of the slow actuator arms and magnetic platters used in typical hard drives. With .03ms access times and 40MB/sec throughput, it doesn't get any faster than this. Or more expensive.

A number of manufacturers, including Quantum and MemTech, make Solid State drives, but ATTO has taken the technology a step further. DRAM memory is volatile, meaning the data kept within it is destroyed when the power shuts off. ATTO has developed the Data Protection System (DPS), which ensures "safe, secure storage of critical data in the event of power loss, brownouts, or other system failures."

Using the HD Tach benchmark, we pegged the SiliconDisk II's seek time at .02ms, which jibes with the advertised performance spec (the typical hard drive clocks around 10ms). Throughput, however, was only 34MB/sec—hardly the 40MB/sec we expected. Turning to the *Norton System Information* hard drive benchmark for a second opinion, we actually regressed and clocked just 32MB/sec. But who's complaining? The fastest Ultra DMA hard drive we've ever seen clocked 7.58MB/sec. And you really can't whine considering ATTO also makes the drive with optional dual UltraWide SCSI-3 ports, enabling a combined data transfer rate of over 70MB/sec via both ports. Unreal.

So how does the SiliconDisk II perform when hooked up as your Windows 95 boot drive? Tell you what: A drive this fast really shows you where your bottlenecks are. First of all, you'd think that bootup would be instantaneous. Not so. A large part of booting Win95 is Registry digestion and device detection, two slow processes. As such, bootup time was decreased on our test machine by a measly five seconds. For kicks, we installed NT 4.0 on both the IBM drive that came with the test machine and the ATTO. Booting NT on the IBM took 40 seconds. The SiliconDisk II shaved off seven seconds.

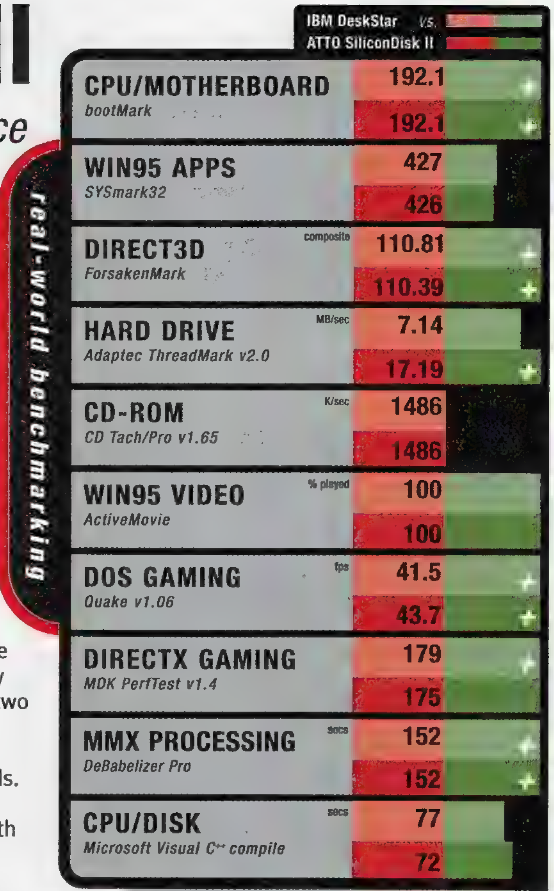
The unique power of the drive was illustrated by video conversion and playback. We used Hitachi's new 1394 (FireWire) video camera and Miro's DV300 capture card to record an eight-second clip. We then converted the clip to an uncompressed format, increasing its size from 27MB to 302MB. Conversion time on the IBM drive took 2:10, while the ATTO drive spit it out in 1:08. We next played back the 720x480 clip on both drives. The IBM drive dropped 74 of 224 frames. The ATTO drive dropped no frames.

ATTO tells us that large banks are using these drives on heavily trafficked transaction servers (the SiliconDisk II can handle 11,000 I/O operations per second per port). The SiliconDisk II is also being used by ISPs for e-mail servers. And of course the idle rich are getting busy with it, too. Who knows, with memory prices steadily dropping and with Moore's law in full effect, we all might have access to this technology sooner than anyone thinks.

— Sean Cleveland

Data Protection System
Disk Status
Battery Status

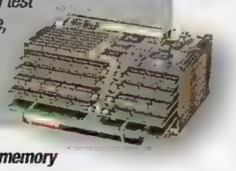
The SiliconDisk II comes in both an external and internal 5.25-inch formfactor, and ranges from 64MB to 2.6GB. LED lights on the front alert you to potential problems and display battery life and backup/restore operations from the internal backup disc.



Benchmark	Unit	IBM DeskStar	ATTO SiliconDisk II
CPU/MOTHERBOARD *bootMark*		192.1	192.1
WIN95 APPS *SYSmark32*		427	426
DIRECT3D *ForsakenMark*	composite	110.81	110.39
HARD DRIVE *Adaptec ThreadMark v2.0*	MB/sec	7.14	17.19
CD-ROM *CD Tach/Pro v1.65*	K/sec	1486	1486
WIN95 VIDEO *ActiveMovie*	% played	100	100
DOS GAMING *Quake v1.06*	fps	41.5	43.7
DIRECTX GAMING *MDK PerfTest v1.4*		179	175
MMX PROCESSING *DeBabelizer Pro*	secs	152	152
CPU/DISK *Microsoft Visual C++ compile*	secs	77	72

UNDER THE KNIFE

We mirrored the IBM DeskStar hard drive from the Micron Millennia Xi tested in boot 21 and put its contents on the SiliconDisk II. We then reran the SiliconDisk II through the bootMarks. Aside from the Threadmark score, which more than doubled, benchmark results didn't change dramatically. (Remember, the Threadmark test performs random writes across the whole drive, simulating real-world performance; it's not a straight sequential read test like HD Tach.) Benchmarks aside, opening applications and documents from Windows Explorer was instantaneous.



DRAM memory modules are stacked one on another, offering instantaneous access to information and bus stuffing bandwidth. This is Pure PC Power at its finest.

Price *$29,000 to $32,000*
Developer *ATTO*
Phone *716.691.1999*
URL *www.attotech.com*

boot verdict 9

INCOMING
every breath they take
could be your last
XICAT
3Dlabs
PERMEDIA POWER
Pervasive 3D
Rage
NVIDIA
MPACT
3Dfx
Microsoft SideWinder Force Feedback Compatible

Full Force Feedback support

3D spatialized sound

8 player LAN Network play

Atmospheric soundtrack

Stunning lighting FX

Product information Number 89

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Gateway **G6-400XL**

Another screamer that can't win the price war

Gateway elbows into the 400MHz zone with its latest offering, but the machine doesn't have enough across-the-board Pure PC Power to justify its price. We're certainly not complaining about the Intel Seattle 440BX motherboard that ups the system bus from 66MHz to 100MHz. And you have to love the pair of 64MB 100MHz SDRAM modules that fill two of the three DIMM slots. Standing sturdy in a full-tower case, the machine offers ultimate room to grow: Two free full-sized drive bays, room inside for an additional three hard drives, and three free PCI slots make the 400XL a mack-daddy mansion. Unfortunately, some of the furnishings inside don't match the promise of the manor.

The 4MB STB Velocity 128 offers fast frame rates—and murky display of 3D accelerated games. The first thing you'll want to do is install the latest drivers to add the mip-map settings that improve the visual quality of textures. But even then, the card still suffers from the rendering flaws that revealed the Riva 128 as an underperformer in our 3D Triathlon visual-quality test (*boot* 21). Although this Riva 128–based card doesn't support AGP 2x, it does store and execute textures directly from memory at AGP 1x speed. 2D tops out at 1280x1024/16-bit color at 75Hz. If you drop down to 1024x768, you get 32-bit color and 85Hz.

Gateway's decision to include IBM's DeskStar 10.1GB hard drive shows that it cares about performance. But where are the incredible numbers we've seen before? The Gateway machine posted 5.99MB/sec on the Threadmark. This is a good score, but the Micron Millennia Xi (*boot* 21) scored a mind-shattering 7.14MB/sec with exactly the same hard drive, motherboard, BIOS settings, CPU, and memory config. Still the DeskStar is a superlative drive with average sequential read speeds of 11.3MB/sec and bursts up to 28MB/sec that almost max out the Ultra DMA 33MB/sec bus.

DVD and CD-ROM chores are handled by Toshiba's second-gen SD-M1102 DVD drive. It read almost every disc we fed it, except CD-RW. Average data throughput on CD Tach was 2,656K/sec, or the equivalent of 15.6x. The drive did, however, reach its advertised 24x speed on the outer edges (the SD-M1102 is a Constant Angular Velocity, or CAV, drive, meaning you see its fastest speed only on the outside edges of full discs). The drive came preconfigured with DMA enabled, lowering CPU utilization a few percentage points. DVD speeds, as measured with DVD Tach, were unsatisfactory. It seems this 2x drive spins DVD media only at 1.1x speed

Sound is handled by the Ensoniq 1371 AudioPCI chipset soldered on the motherboard. The chipset supports Sound Blaster Pro, MS DirectSound 3D, MPU-401 I/F and MIDI, but doesn't fully support Aureal's A3D API. Boston Acoustics' Media Theatre Speakers round out the sound system. They sound decent enough for bundled speakers, but lack sparkle in the satellites and punch in the subwoofer.

The G6-400XL benchmarked on par with other 400MHz monsters, lagging only in hard drive and MMX processing performance. Unfortunately, the price is $900 more than the kick-ass NEC Direction 400MHz reviewed in our last issue. A few tweaks and a price cut would make the G6-400XL the one to beat.

—*Sean Cleveland*

EVERYTHING BUT AN INTERCOM SYSTEM

Extra controls along the top of the keyboard provide easy access to CD-ROM audio playback, volume settings, a mute button, and messaging for the 56K modem with speakerphone support. Of course, you'd have to keep the computer on 24/7 to answer incoming calls.

WANTED: ONE BACK-UP GENERATOR

For such a large sturdy case, one would expect a large power supply in the 300-watt to 350-watt range—and not the wimpy 200 watts that ships with the G6-400XL. Packing this case with additional drives and peripherals would easily overload this power supply.

under the hood

THE BRAINS

CPU	Intel Pentium II 400MHz
L2 CACHE	512K BSRAM (internal)
RAM	128MB 100MHz SDRAM (384MB max)
Motherboard	Intel SE440BX, ATX formfactor

THE BRAWN

Video	STB Velocity 128 nVidia 4MB AGP
Hard Drive	IBM DeskStar 10GB Ultra DMA
DVD-ROM	Toshiba SD-M1102
Expansion Bus	One AGP, three PCI, one ISA, one shared PCI/ISA
Fax/Modem	Gateway 2000 TelePath 56Kbps X2
I/O Ports	Two USB, two serial, one parallel, one gameport

THE BEAUTY

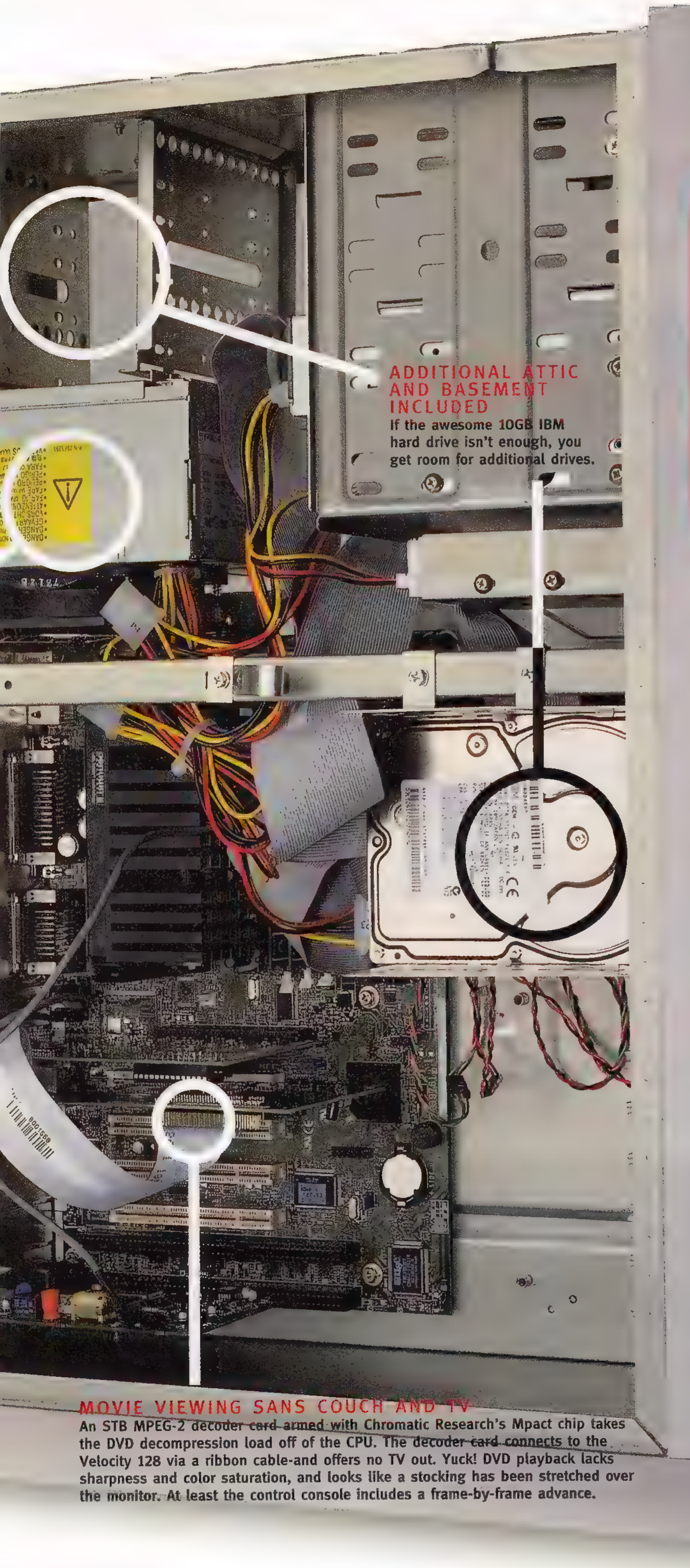
Display	Gateway 2000 EV900, 19-inch, 0.26mm dot pitch
Sound	Ensoniq 1371 AudioPCI (soldered on motherboard)
Speakers	Boston Acoustics Media Theater Speakers
Other	Gateway keyboard with CD, volume, and messaging controls; Microsoft mouse

EXPANSION MAP

AGP	STB Velocity 128
PCI	STB Mpact DVD MPEG-2 Card
PCI	Free
PCI	Free
PCI	Free (shared)
ISA	Free (shared)
ISA	TelePath 56Kbps X2 Modem

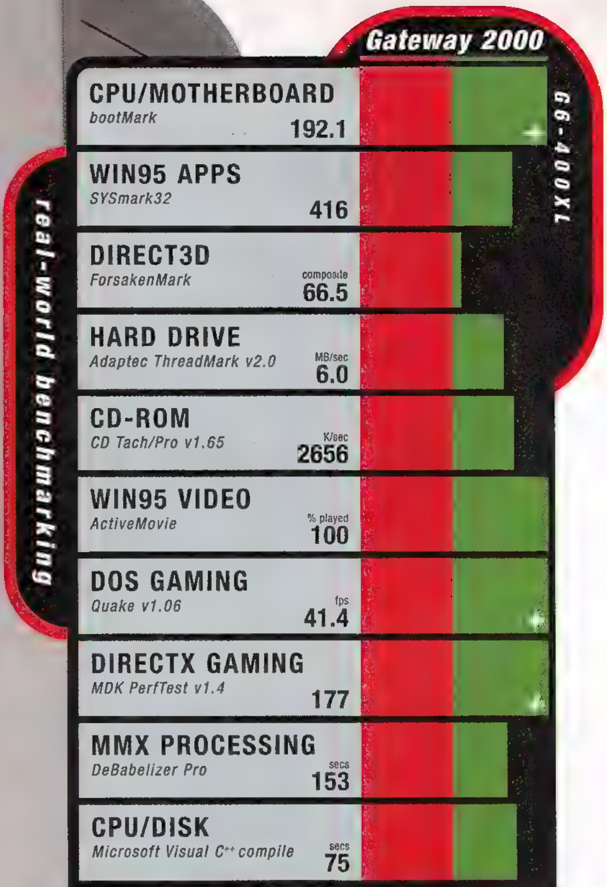
THE BUNDLE Windows 95 | Windows 98 upgrade certificate | Microsoft Home Essentials 98 and Professional Resource Suite | G-Police | Redline Racer | Quicken Basic 98 | Jack Nicklaus 4 DVD | Warner Music Group Does DVD Vol. 2

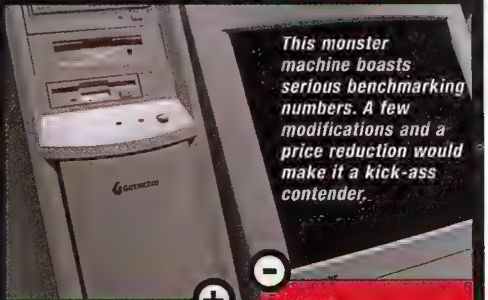
boot	*down*
0:58	0:08



ADDITIONAL ATTIC AND BASEMENT INCLUDED
If the awesome 10GB IBM hard drive isn't enough, you get room for additional drives.

MOVIE VIEWING SANS COUCH AND TV
An STB MPEG-2 decoder card armed with Chromatic Research's Mpact chip takes the DVD decompression load off of the CPU. The decoder card connects to the Velocity 128 via a ribbon cable-and offers no TV out. Yuck! DVD playback lacks sharpness and color saturation, and looks like a stocking has been stretched over the monitor. At least the control console includes a frame-by-frame advance.





This monster machine boasts serious benchmarking numbers. A few modifications and a price reduction would make it a kick-ass contender.

+	−
128MB RAM	High price
Large tower case	Underperforming storage drives
Zip drive	Wimpy power supply
Win98 upgrade coupon	No TV out
Large Ultra DMA hard drive	Poor DVD quality

Price $3,750
(includes 19-inch monitor)
Company Gateway 2000
Phone 800.846.4208
URL www.gateway.com

boot verdict 8

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

Image Is Everything

Video frame grabbers turn your VCR into a digital camera

You. Arnold. Together. In your favorite scene from Terminator 2. *It's as good as done. All you need is image-editing software, a VCR or camcorder, and one of these video frame grabbers attached to your PC's parallel port. A frame grabber snaps still images from any video device that has a composite or S-Video output, and imports them into your PC, making your VCR or camcorder a digital camera.*

—Rick Popko

The GrabIT does best when the movement of what you're capturing is kept to a minimum.

GrabIT Pro

The GrabIT snags nice pics—just as long as you're snagging still lifes. The high-quality mode captures resolutions up to 1600x1200. The compression quality is as good as the Snappy's (also reviewed here), but the object you're grabbing has to be completely still.

Using a Sony DV camcorder's S-Video out, we tried to grab an image of our test model a few times at the highest quality setting, but the image consistently came back with bad banding and color bleeding. We thought we might have had bad drivers. We were about to give up in frustration—like the Snappy, GrabIT takes between five and ten seconds to process each picture—but decided to try one more time with our model sitting absolutely still. It worked, and the picture quality was good.

You can set the video to capture at 8-bit or 24-bit color, and apply a motion filter—this helps when you're trying to capture a fast-moving scene. While the motion filter helps to stabilize movement, it does add blur. The GrabIT doesn't hold a candle to Snappy when it comes to moving pictures.

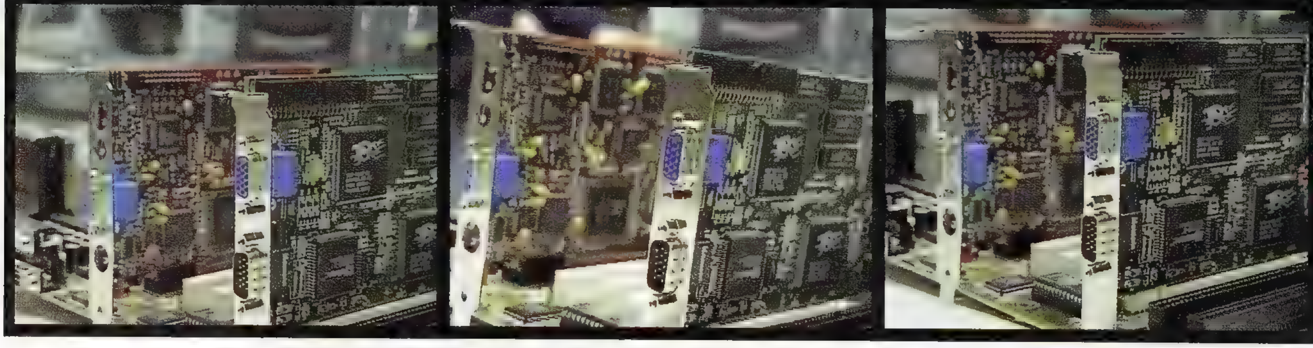
The best thing about GrabIT is its time-lapse photography option. It lets you set the number of frames in your animation and how often GrabIT takes a picture. You can save the individual frames as TIF, JPG, PCX, or TGA. In our test run, we set the time-lapse option to snag 60 frames, one every second. After we snagged the images, we brought the numbered TGAs into Adobe *Premiere* and assembled them into a short AVI clip.

While we like GrabIT's time-lapse functions, we wish it included a sound effect that goes off whenever an image is snapped. We'd also like to see a remote trigger option. Finally, when we launched into the Video Clip section—which simply grabs digitized video from analog sources—we got an error stating "IRQ 5 and IRQ 7 cannot be used." Turns out we had to go into the control panel and tweak the default multimedia settings. When it did work, we weren't impressed. We estimate we were probably getting about a frame a second (Hollywood blockbusters run at 32fps).

GrabIT Pro has one S-Video and two composite inputs, plus a composite thru for previewing the material to be grabbed. You need the thru because parallel ports can't handle a TV signal coming in at 30 frames per second. GrabIT is a great device for wannabe animators, but if you're looking for a single-frame grabber, go for the Snappy.

Price $150
Company Aims Lab Inc.
Phone 510.661.2525
URL www.aimslab.com

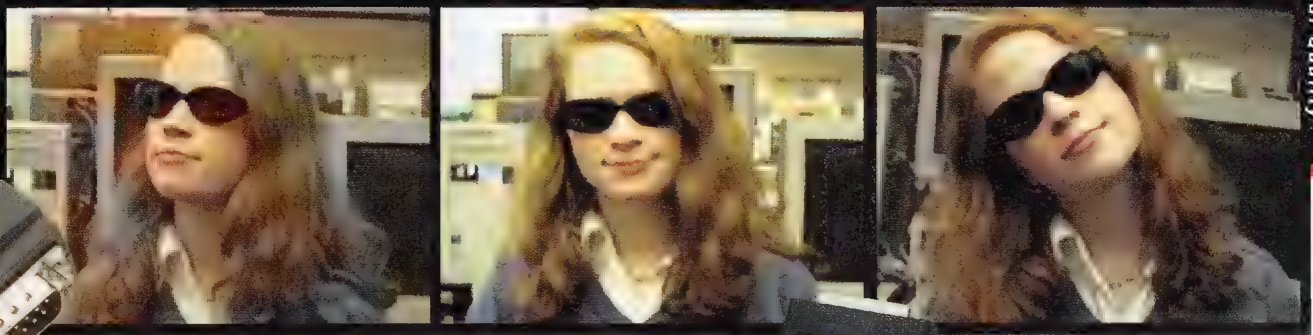
boot verdict 6



GrabIT Pro: Rivals the Snappy. **Video Sphinx Pro: Slight aliasing around the edge.** **Snappy 3.0 Deluxe: Best of the bunch.**

These frames demonstrate how well each grabber captures a still image.

Visual Quality



GrabIT Pro: Check out the color blotches.

Video Sphinx Pro: Notice the slight aliasing.

Snappy 3.0 Deluxe: The highest-quality motion snap.

The frames demonstrate how well each grabber captures a moving image.

Visual Quality

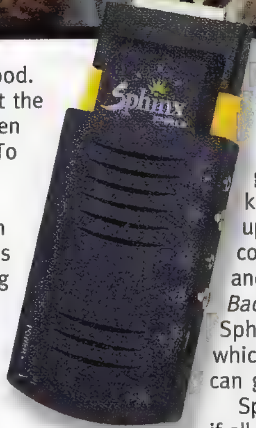
Video **Sphinx** Pro

In one word: impressive. Video Sphinx Pro records high-quality audio and video through your computer's parallel port and saves it as MPEG, in either still or movie form. The device has S-Video, composite, and audio-in, and composite/audio-out for monitoring video before captures. Before we could begin testing the Sphinx, we had to go into our BIOS and change the parallel port setting from EPP to ECP. But once we did that, we were running like the wind.

The device uses the C-Cube MPEG chipset (the same technology that powers many DVD decoder cards) and captures at 160x112, 176x112, 320x240, and 352x240. When we recorded at 352x240, we got an annoying thin band at the bottom of the image. Just to be sure, we hooked up the Sphinx to another computer and tried again. It didn't help. Actually, the thin band wouldn't have been so bad had FutureTel incorporated a cropping tool to take it out. It's a shame, because the MPEG quality is quite good.

The good news is that the thin band goes away when you capture at 176x112. To give you an idea of the quality you can expect, check out GLOVE.MPG on the bootDisc. The file was captured at 176x112 using maximum compression. Be warned: The video is not for the squeamish.

The video compression rate is scalable at all capture resolutions. When capturing at 352x240 at the highest compression setting, you get 7.15MB per minute. At the lowest compression setting, you can push the slider to capture 21.46MB per minute. While the video quality at the lowest compression setting looked practically flawless, it did drop frames.



The Sphinx's forte is MPEG video capture—though it will drop frames.

You can also adjust your audio parameters from 44KHz at 224Kbps to 32KHz at 32Kbps.

FutureTel deserves credit for a great out-of-the-box experience. The kit includes everything you need to get up and digitizing right away, including composite, S-Video, and audio cables, and Kai's *PhotoSoap SE* and Macromedia *BackStage*. Our favorite perk of the Sphinx package is the MPEG editor, which has a handy trim function so you can glue multiple MPEG clips together.

Sphinx takes a middling still picture, so if all you want is a good still, go with the Snappy. If you want MPEG clips for your web site or CD-ROM, get the Sphinx.

Price ***$350***
Company ***FutureTel***
Phone ***888.774.4692***
URL ***www.futuretel.com***

boot verdict 8

Snappy 3.0 Deluxe

Snappy takes the best still grabs from a moving video source we've ever seen. It'll give you a picture clear enough to use in your family greeting cards or corporate brochure. Credit the HD-1500 chip, proprietary technology that evolved over many years from the Amiga platform. In fact, some of Play's core developers worked on the original Video Toaster, a hardware/software kit that made the Amiga a revolutionary platform for inexpensive yet high-quality video effects editing.

Snappy saves stills as BMP, JPG, PCX, TIF, or TGA. It also performs continuous snaps at resolutions up to 320x240. In this mode, if you try to bump resolution up, Snappy defaults back to single-snap mode. With the Deluxe upgrade ($40), Snappy captures audio through your soundcard and locks it to your image. The upgrade also captures AVI clips. Unfortunately, the AVIs save at a low frame rate and are almost unwatchable.

Your color palette can be set to 4-, 8-, 16- or 24-bit color. Resolutions can be fixed between 160x120 and 1500x1125. After your image has been snapped, you can preprocess it before saving it to disk. Options let you tweak color, brightness, contrast, picture, sharpness, and tint.

We were disappointed that the Deluxe upgrade didn't have advertised stop-motion capabilities built into it. Even the online manual included instruction on how to animate with Snappy. But when we called tech support about this missing link, they informed us the animation capabilities were pulled out of the upgrade at the last minute because it was buggy and the upgrade needed to ship. We hesitate to say the Deluxe upgrade is worth the $40 price, but it does come with Adobe *PhotoDeluxe 2.0*, Gryphon *Morph*, and Kai's *Power Goo SE*. If you think these apps are worth $40, buy the upgrade. We'll wait and see how the animation feature finally plays out before recommending it.

SNAPPY
VIDEO SNAPSHOT

The Snappy takes the best picture in the roundup—and it isn't scared of movement.

Price ***$100, $40 for Deluxe upgrade***
Company ***Play Inc.***
Phone ***916.851.0800***
URL ***www.play.com***

boot verdict 8

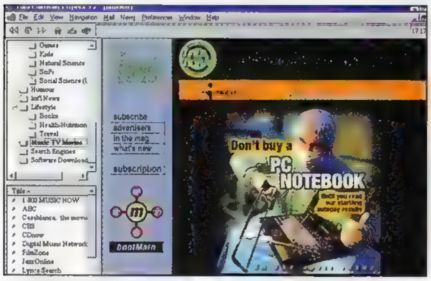
Opera

This browser sings

TRY IT ON THE DISC

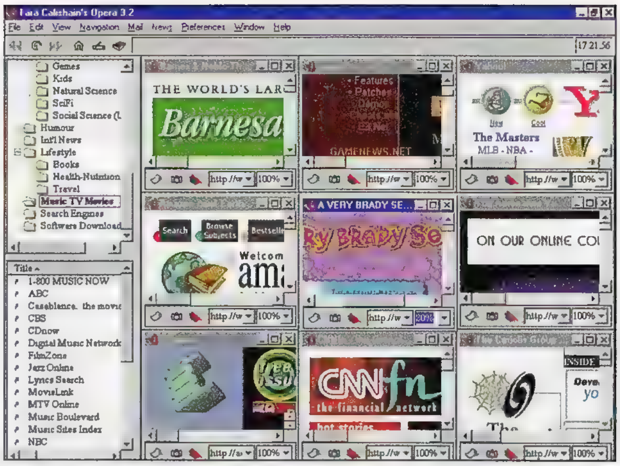
While Godzilla and King Kong battle each other for global domination in the browser arena, you might want to check out an obscure Norwegian company that's making a speedy little browser called *Opera*.

The application weighs in at a little more than a megabyte. An image-loading toggle at the bottom of the screen turns graphics loading on and off, and pages can be resized from 20% to 1,000% instantly. Multiple web pages are viewable within the same browser window, meaning you don't have to launch a new window every time you want to view a separate URL. We loaded ten web pages simultaneously and flipped through them constantly without slowing *Opera* down.


Don't buy a PC NOTEBOOK
subscribe
advertisers
in the mag
what's new
subscription
bootMain

The "Hot List" windows are handy but will crowd your screen, unless it's 17 inches or bigger.

The browser's preferences let you specify whether images, text, and other content should be cached. When exiting, you can save the "last window." This is handy for when you want to pick up surfing where you left off, but don't want to change your default start page.


Tara Calishain's Opera 3.2
File Edit View Navigation Mail News Preferences Window Help
Games
Kids
Natural Science
SciFi
Social Science
Humour
Int'l News
Lifestyle
Books
Health-Nutrition
Travel
Music TV Movies
Search Engines
Software Download
1-800 MUSIC NOW
ABC
Casablanca
CBS
CDnow
Digital Music Network
FilmZone
Jazz Online
Lyrics Search
MovieLink
MTV Online
Music Boulevard
Music Sites Index
NBC
THE WORLD'S LAR
Barnesa
GAMENEWS.NET
The Masters
MLB - NBA -
A VERY BRADY SE
Brady Se
ON OUR ONLINE CO
CNNfn the financial network
hot stories

Opera offers nine windows and no waiting.

Despite *Opera*'s obvious appeal, we don't think it's going to displace *IE* or *Navigator*. It doesn't support Java, cascading style sheets, or ActiveX, and its very basic mail function will send but not receive mail. Its "Hot List" (bookmark) windows are handy at the side of the screen, but will crowd your web page unless you have a monitor that's 17 inches or larger. We also had trouble using an authentication form and a couple of online pull-down menus.

Currently, there's no commercial distribution for *Opera*, but you can download it from the web site. If all you want to do is load pages, view images, and read text, we suggest you give *Opera* a try, because it does these most-essential functions very well.

—Tara Calishain

Price $35
Company Opera Software
Phone 476.384.8634
URL www.operasoftware.com

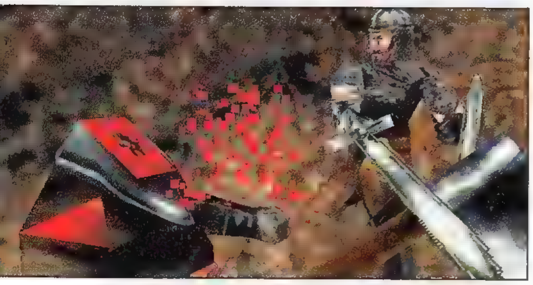
boot verdict 8

Die By The Sword

Hacked off his arm and beat him with it

TRY IT ON THE DISC

Die By The Sword is an inspired twist on the increasingly tired action-fighting genre. The spin this time is that you have absolute control over your hero's sword via Tantrum's "VSIM" engine, which calculates the actual position and momentum of your jointed character. There are two swordplay modes: arcade-style single-button keyboard attack and VSIM, which incorporates a mouse or joystick. We found the mouse approach is the most intuitive way to play.



Decapitation is only one of the many fun and socially interactive things you can do in **Die By The Sword.**

The game fully supports 3Dfx, Rendition-based cards, and Direct3D. Hardware acceleration gives you decent texture smoothing, though some maps appeared pixilated. We were most disappointed by the frame rate. The 20fps to 25fps we got was nowhere near PlayStation quality, and nonaccelerated players will see frame rates dip below 10. Clipping is minimal, but when fighting in close quarters, you'll see your sword pass through walls. The wonderfully texture-mapped environments range from claustrophobic caves to wide-open fields. The Dolby SurroundSound effects are dense and satisfying—though actor Michael York sounds sleepy as the voice of the trainer. And while the enemy AI does vary, many enemies repeat the same moves.

Gory dismemberments and wounds are rendered in admirable detail. You can even hack off someone's arm, pick it up, and beat him with it. And in tough combat, your hero may well find himself hopping around on one leg. Still, there are problems. The camera angles often make it tough to get a good perspective on the action and enemies are either very stupid or hyper-tough, with no middle ground.

CHECKLIST

Die By The Sword
Version: 1.0
Max Res/Color 640x480/16-bit
Win95
3D Acceleration
Direct3D 3Dfx Glide
DirectX
DirectDraw DirectSound
DirectPlay
Multiplayer
Modem Direct/serial IPX

Die By The Sword is a meaty package, stuffed with arena combat, multiplayer support, and a full adventure game that takes your hero through several realms. Though the story is weak, the visual style and strong level design redeem it. While initially a frustrating experience, *Die By The Sword* becomes more rewarding as you get a handle on the controls and build on all the fluid movements of your character.

—Tom McDonald

Price $50
Developer Tantrum
Publisher Interplay
Phone 800.454.6064
URL www.interplay.com

boot verdict 7

Meet the future. Or you're just meat.

It's DVD. It's here. And it shreds through huge chunks of 3-D animation like nothing else.

And nothing else is close to NewCom's DVD2 solutions.

We give you everything you can handle. Like full multiformat capability. Eye-popping DVD video. And 5.1 channels of pumping audio.

And the price? You can handle that, too.

It's better than CD audio, slicker than laser disc video. Get NewCom DVD. Or suffer the consequences.

CD/DVD drive works with any VGA card. CINEMA II delivers seamless DVD playback in all formats with Dolby AC-3 sound. Or get it all with CINEMA II Plus.

change. or die.

TEST YOUR SENSES

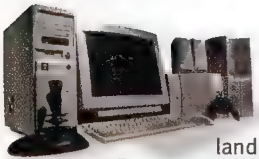
Product Information Number 253

NEWCOM®

www.newcominc.com 818.597.3200

Alienware **Area 51**

The truth is in here



boot KICK ASS! PRODUCT

Today, at approximately 12:00 hours, a mysterious computing device was spotted landing in Brisbane, CA. Sent to investigate the disturbance, we secured the area, dispatched all witnesses, and sequestered the device in the bootLab for an autopsy. Our preliminary findings suggest the alien race that constructed the device is highly intelligent, efficient, and pro-active in its approach to engineering.

It also appears the computing device was expressly designed to conquer the performance levels of comparable Earth devices.

The Area 51 device includes some of the fastest components in the known universe. Among the discoveries: a 400MHz Pentium II, 128MB 100MHz SDRAM, dual Voodoo^2 cards, and Real3D's StarFighter AGP card powered by Intel's i740 chipset. We found all these parts inserted into a Soyo 5Y-6BA mainboard (Intel's 440BX core-logic chipset was fused to its hull). This mainboard—boasting eight expansion slots, including five PCI—was a rare find indeed.

Further investigation revealed that the device's core power generators are augmented by equally impressive subsystems. Its external data pipeline, consisting of a Diamond Supra dual-line modem, is capable of transfer rates up to 112Kbps. The audio subsystem includes a Sound Blaster 16 (for DOS legacy support) and Diamond's newest PCI audio accelerator, the Monster Sound MX200, which offers PCI-accelerated wavetable, multiple digital audio streams, and Aureal 3D compatibility. And nobody in the universe could possibly dispute the raw power of dual-Voodoo^2 SLI care of Diamond Monster 3D II.

The construction of the entire Area 51 device is extremely solid, but due to the high operating temperature of its internal components, the device requires a variety of integrated cooling elements. These fans are dedicated to specific areas, including the 300-watt flux capacitor and CPU. In an example of simultaneous engineering marvel and stupidity, a cavity on the exterior metal chassis had been bored to accommodate one of the fans, but no filter was included to block out airborne contagions.

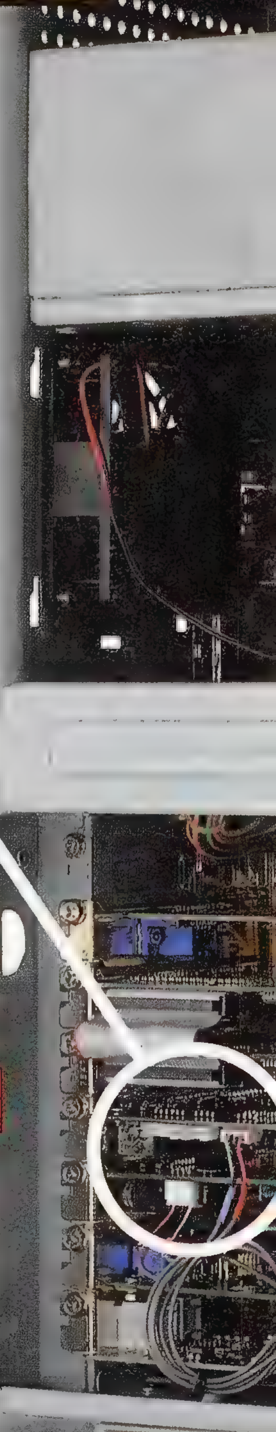
Before we could power up the Area 51 device, our scientists first had to figure out how to get it operational again. It seems the impact of landing unseated the CPU (let's hope the aliens protect their devices better when they explore the universe en masse). After we re-seated the CPU, we had to deal with a miasma of snaking cables, power conduits, and assorted connectors. Although overwhelmed at first, we were able to reattach everything in the right place, guided by color codes on the rear panel.

As expected, the Area 51 device set new records in our CPU/motherboard and hard drive tests, completely crushing anything we've seen to date. And thanks to the two Voodoo^2 cards, the Area 51 fueled *Forsaken* and *GLQuake* to more than 250fps and 187fps respectively. (Further investigation revealed the alien manufacturer had turned off the videocards' V-sync mode to achieve these otherworldly frame rates. This brazen maneuver may result in ugly frame shearing, so proceed with caution.)

The Area 51 computer is a remarkable device. We implore all *boot* readers to contain discussion of this alien marvel to the planet Earth.

—Bryan Del Rizzo

SPARQ WARS
There's no denying that having 1GB of mobile storage is attractive, but the SparQ drive comes nowhere near Syquest's "fast-as-a-hard drive" claim. During our tests, the SparQ had a random access time of 20.3ms (yawn), and a lowly 6.9Mbps burst speed. And its 67.2% CPU utilization was way too high.



DVD RESURRECTION
The inclusion of the Hitachi DVD-ROM drive is nice, but we were disappointed with the performance of Real Magic's Hollywood II MPEG-2 card. Video quality was on the grainy side, and with prolonged viewing, we noticed skipped frames, resulting in out-of-sync audio.

under the hood

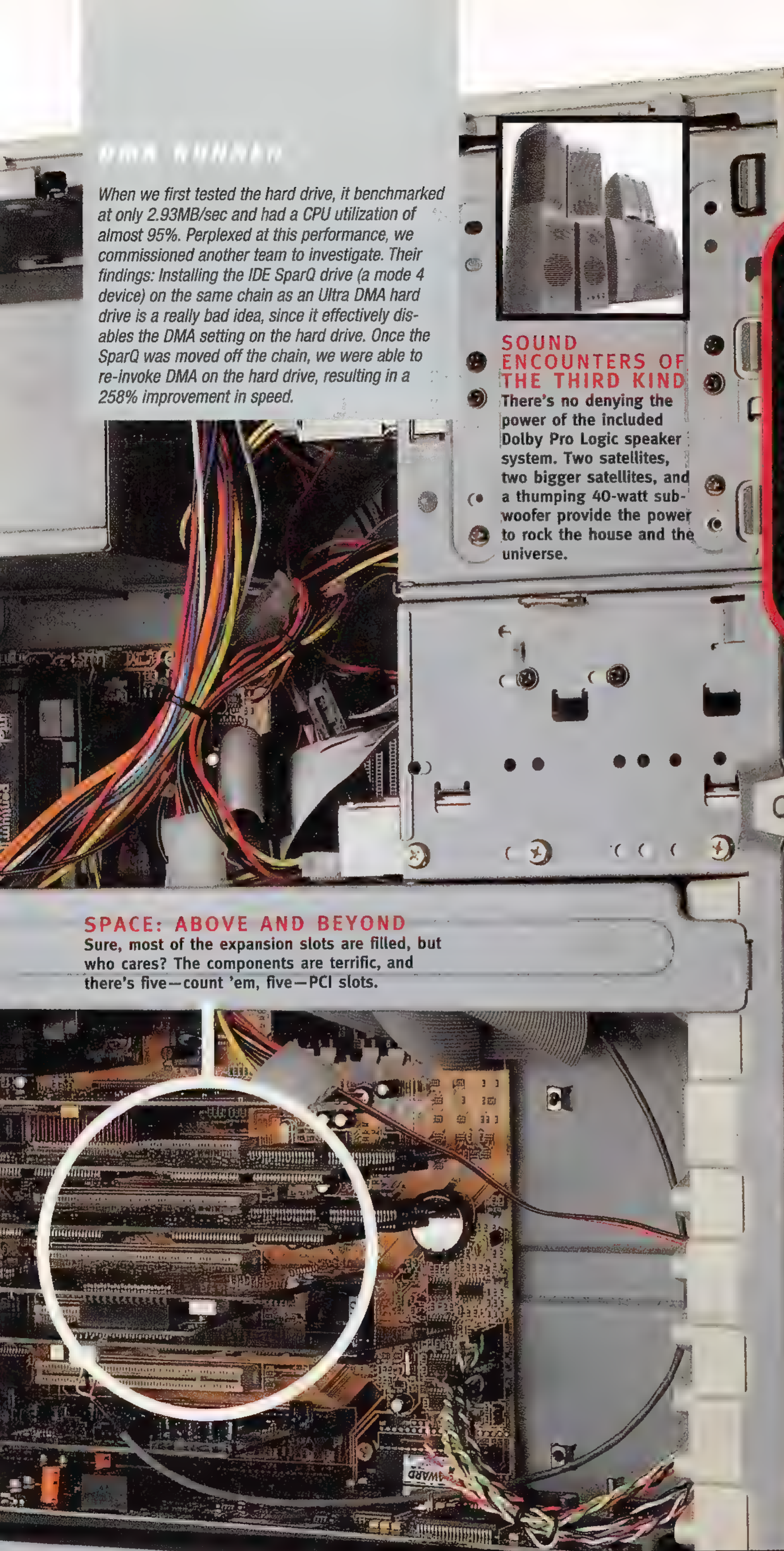
THE BRAINS	
CPU	Intel Pentium II 400MHz
L2 Cache	512K pipeline burst
RAM	128MB 100MHz SDRAM (expandable to 512MB)
Motherboard	Soyo 5Y-6BA with Intel 440BX core-logic chipset
THE BRAWN	
Video	Real 3D StarFighter (Intel i740) with 8MB SGRAM; dual SLI Diamond Monster 3D II (3Dfx Voodoo^2); Real Magic Hollywood II MPEG-2 card
Hard Drive	11.5GB Maxtor Diamond Max 2880 Ultra DMA
DVD-ROM	Hitachi GD-2000
Expansion Map	Five PCI, two ISA, one PCI/ISA (shared)
Fax/Modem	Diamond Supra Sonic dual-line 112Kbps modem
I/O Ports	Two USB, two serial, one parallel, one gameport, two PS/2, audio in/out, TV-out
THE BEAUTY	
Case	Three 5.25-inch, two 3.5-inch drive bays
Display	Optiquest V95, 19-inch, 0.26mm dot pitch, 1600x1280@76Hz max resolution
Sound	Creative Labs Sound Blaster 16; Diamond Monster Sound MX200 PCI audio accelerator (Aureal 3D-compatible)
Speakers	Altec Lansing ACS500/ACS31 combo (four satellites and subwoofer)
Other	1GB Syquest SparQ drive, Microsoft Sidewinder Pro and Sidewinder GamePad

EXPANSION MAP

AGP	2D/3D Video
PCI	3D Video
PCI	3D Video
PCI	3D soundcard
PCI	MPEG decoder card
PCI	Free
ISA	Soundcard
ISA	Dual-line modem

THE BUNDLE Windows 98 | Heavy Gear | Jedi Knight | Shadows of the Empire | Wing Commander: Prophecy | Redline Racer | Andretti Racing

boot	*down*
1:21	0:10



DMA RUNNER

When we first tested the hard drive, it benchmarked at only 2.93MB/sec and had a CPU utilization of almost 95%. Perplexed at this performance, we commissioned another team to investigate. Their findings: Installing the IDE SparQ drive (a mode 4 device) on the same chain as an Ultra DMA hard drive is a really bad idea, since it effectively disables the DMA setting on the hard drive. Once the SparQ was moved off the chain, we were able to re-invoke DMA on the hard drive, resulting in a 258% improvement in speed.

SOUND ENCOUNTERS OF THE THIRD KIND

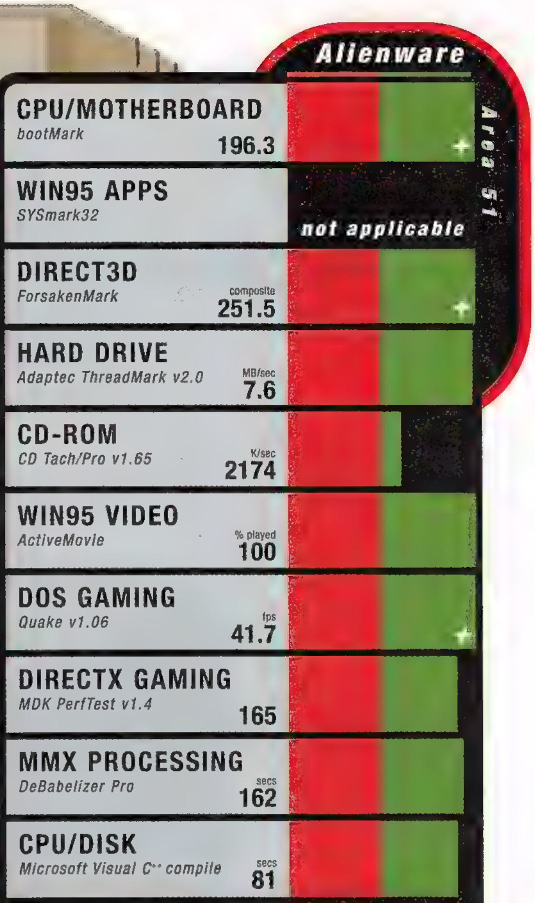
There's no denying the power of the included Dolby Pro Logic speaker system. Two satellites, two bigger satellites, and a thumping 40-watt subwoofer provide the power to rock the house and the universe.

SPACE: ABOVE AND BEYOND

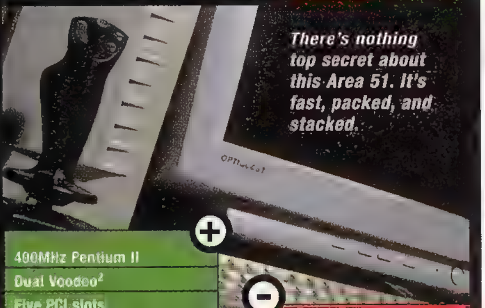
Sure, most of the expansion slots are filled, but who cares? The components are terrific, and there's five—count 'em, five—PCI slots.

real-world benchmarking

Alienware Area 51



Test	Benchmark	Unit	Score
CPU/MOTHERBOARD	bootMark		196.3
WIN95 APPS	SYSmark32		not applicable
DIRECT3D	ForsakenMark	composite	251.5
HARD DRIVE	Adaptec ThreadMark v2.0	MB/sec	7.6
CD-ROM	CD Tach/Pro v1.65	K/sec	2174
WIN95 VIDEO	ActiveMovie	% played	100
DOS GAMING	Quake v1.06	fps	41.7
DIRECTX GAMING	MDK PerfTest v1.4		165
MMX PROCESSING	DeBabelizer Pro	secs	162
CPU/DISK	Microsoft Visual C++ compile	secs	81



There's nothing top secret about this Area 51. It's fast, packed, and stacked.

+
- 400MHz Pentium II
- Dual Voodoo^2
- Five PCI slots
- PCI audio
- Great performer
- Awesome sound system
- Cool case
- Good software bundle

−
- Tight case
- Mushy keyboard
- Weird power button on front
- Middling DVD playback

Price $3,999,
Company Alienware PC Systems
Phone 800.494.3382
URL www.alienware-pc.com

boot verdict 9

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

INDEPENDENCE DAY

Alienware reckons that not having a reset button on the front can prevent unwanted accidents. Maybe, but we'd rather risk that then have to deal with this funky power button that only works in conjunction with the power button on the back of the case.

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*** OFFER EXTENDED THROUGH AUGUST 31, 1998**

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OLYMPUS
OLYMPUS LENS

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OLYMPUS
FLOPPYDISK ADAPTER
SmartMedia
FLASHPATH

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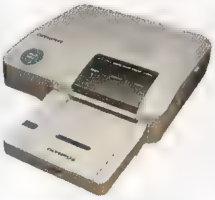
For those who don't want to be married to a computer day after day, there's emancipation. The D-320L has video output that directly hooks to your TV. The entire family can now view your shots without the need for a computer. And the images can be videotaped on a VCR and sent to relatives or business associates.



Connect the camera to our photo printer and presto! Get the photo you want, when you want it.

Another direct connection is from the camera to the new Olympus P-300 personal photo printer. In a little over a minute you can print true photo quality images directly from the camera. Finally, digital independence!

OUR REVEALING BACK

It tells you a lot. For one thing, there's the new 2" screen that displays real images in brilliant color. You can use it as a viewfinder or to review your shots one at a time or nine at a time. Or use it to present a slide show by automatically displaying each image one at a time. And if stop action inspires you, the D-320L can capture 9 shots per second in a single frame.

A FINAL BYTE

So purchase a new D-320L Digital Camera by August 31, 1998 and get a FlashPath Floppy Disk Adapter for free. And start enjoying downloading high resolution camera images with floppy disk convenience. For more information on Olympus Digital Products visit us at www.olympus.com/digital. Or call us at 1-800-622-6372 and we'll answer all your questions.

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Product Information Number 260

F-15

Coded for comfort

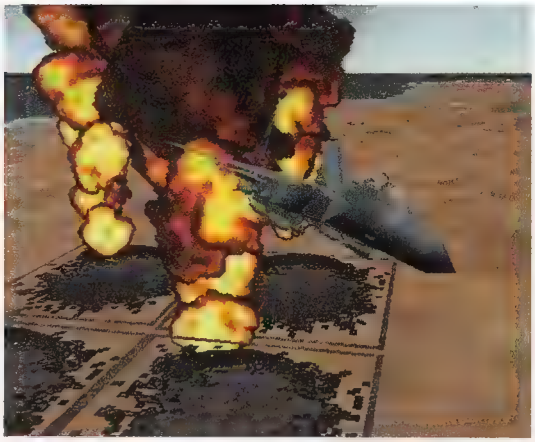
Flying carefully below today's hardware ceiling, *F-15* is defined by well-chosen design compromises. Running at 640x480 in mere 8-bit color and mainly simulating open desert, the game virtually eliminates texture-loading pauses. And without a cooperative multiplayer mode, you're left in permanent charge of both the pilot and copilot/gunner stations. But by way of compensation, all controls remain active in pause mode, giving you time to adjust your avionics.

In combat, the compromises pay off. The flight model feels like you're piloting a big jet. It has just the right amount of power and a realistic lumbering quality. Wingmen are smart and fairly proactive, and missions—based on either Desert Storm or a near-future Iranian war—are just hectic enough. An awesome mission builder lets you program events such as audio playback, and airplane takeoffs. At operational altitude, the texture-map terrain looks incredibly real. Resolution blurs about halfway to the horizon in a desert mirage effect, and distant hills tend to roll like waves.

Aircraft exteriors are stunning, with detailed pilots and weaponry. Ground structures are sparse but sharp, and the virtual cockpit is up to Jane's best standards. Transparent smoke and vapor trails are the icing on the cake. With graphics goodies maxed out, frame rates averaged in the mid teens on a 3Dfx-equipped P-II 233MHz, peaking at over 20fps in sparse areas and dipping as low as 10fps when the view is filled. However, even on the low end, the sim always feels smooth.

Though a shade less dazzling than Jane's *Longbow 2*, *F-15* is a meaty, well-balanced product that's guaranteed to get your adrenaline flowing.

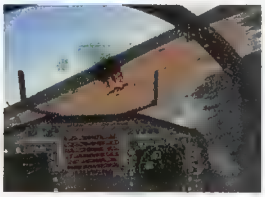
—Frank Lenk



F-15 gives hot ground-strike action over the Kuwaiti oil fields.

CHECKLIST

F-15
Version: 1.0
Max Res/Color 640x480/8-bit
Win95
3D Acceleration
3Dfx Glide
Multiplayer
LAN Modem Direct/serial TCP/IP



The virtual cockpit is up to Jane's usual high standards. Controls remain active and readable at all times.

Price $50
Developer Jane's Combat Simulations
Publisher Electronic Arts
Phone 800.245.4525
URL www.janes.ea.com

boot verdict 8

Forsaken

In living color

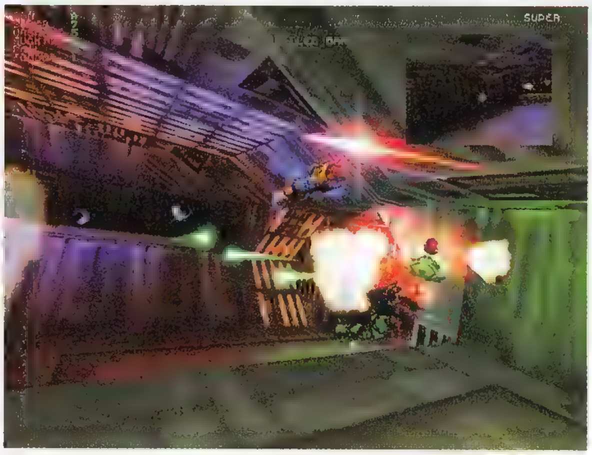
Forsaken is your ticket to stomach-churning, first-person combat. The Earth is toast, and it's time to grab whatever tasty scraps are left over. Choose from a variety of hover-bikes and riders, and loot darkened texture-mapped tunnels. Bigger weapons and power-ups galore await you.

Forsaken's 3D-accelerated visuals are so sweet, your eyes will get cavities. With up to 18,000 polygons per level, a daunting number of texture-mapped tanks and rocket-launchers hinder your path. The antagonists' polygon counts range up to 800, so you'd better have the CPU horsepower and a beefy 3D accelerator. Effects fly fast and furious. In fact, *Forsaken* shows all those D3D naysayers what can be accomplished by less complaining and more-effective coding—delectable colored lighting, particle effects for sparks, and uber-alpha-blending for weapon bursts. Varied, tiled textures make each level unique, although low frame-rate, animated lava textures look hokey when compared to the realtime water deformation effects.

The technology is solid, but if you're expecting a gameplay revolution, look elsewhere. *Forsaken* follows first-person action convention—you hunt down keys to make your way out of the chaos. Enemy AI for automated weapons is easily defeated, but rival bikers strafe, retreat, and hunt you down. Multiplayer modes are varied, to say the least, with death matches, capture the flag, and bounty hunts.

With its succulent graphics and solid gameplay, *Forsaken* will get you thinking: What would have happened if *Descent To Undermountain* had used this engine?

—Andrew Sanchez



***Forsaken** pulls no visual punches. And the game plays as good as it looks.*

CHECKLIST

Forsaken
Version: 1.0
Max Res/Color 1024x768/16-bit
Win95
3D Acceleration
Direct3D Glide PowerSGL
3D Sound Acceleration
Aureal A3D
DirectX
DirectDraw DirectSound
DirectPlay DirectInput
Multiplayer
Modem Serial TCP/IP IPX

Price $50
Developer Probe
Publisher Acclaim
Phone 516.656.2456
URL www.acclaimnation.com

boot verdict 9

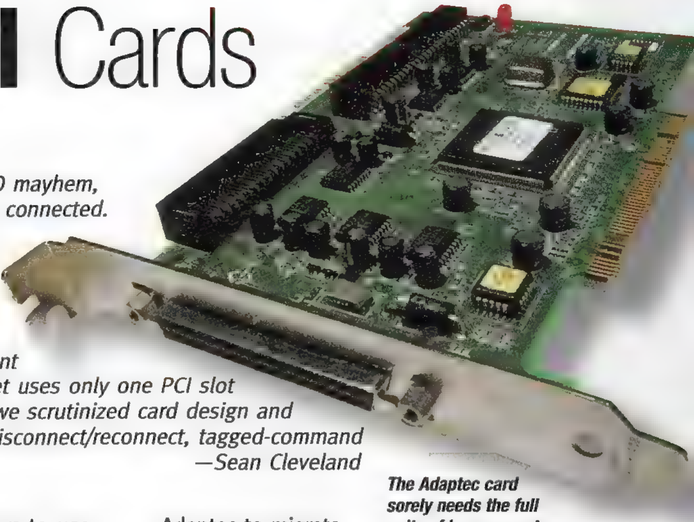
Dual-Channel **SCSI** Cards

Two pipes, double the performance

Dual-channel SCSI cards offer two full UltraSCSI channels for unrestricted I/O mayhem, and double both data transfer rates and the number of devices that can be connected. Using both channels also doubles the total cable length to six meters and delivers simultaneous streams of high-speed data. But, most importantly, the dual-channel design lets you separate slower devices from faster UltraWide drives, precluding the performance degradation that occurs when fast and slow devices share the same pipe.

Both cards here use second-gen technology that integrates two independent processors into a single chip. Each gives you the power of two adapters, yet uses only one PCI slot and one IRQ. The two cards here yielded almost identical performance, so we scrutinized card design and feature sets. Both cards are PCI 2.1 compliant and support scatter-gather, disconnect/reconnect, tagged-command queuing, and auto-termination.

—Sean Cleveland



The Adaptec card sorely needs the full suite of bus connectors.

Adaptec **AHA-2940UW** Dual

The 2940UW Dual is powered by two independent 20mips processors on an integrated Adaptec AIC-7895 chip. The card is split between internal and external buses, with a 68-pin high-density SCSI-3 connector and a 50-pin low-density SCSI-1 connector on the internal bus, and a 68-pin high-density SCSI-3 connector on the external bus.

We were confused by this architecture when we first received the card. Unlike the Diamond card reviewed here, you're denied the requisite connectors to use both channels internally. This means you can't run two hard drives together under NT unless they're daisy-chained on the same channel. And although running two drives on separate channels only offers slightly better performance, the 2940UW Dual still denies you 255 multithreaded I/Os per channel, which is beneficial for servers and 3D workstations.

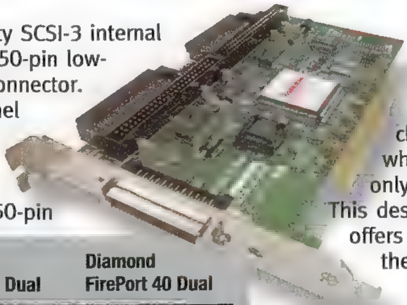
With Adaptec's background, we expected this card to offer both top performance and full internal connectivity. We also expected Adaptec to migrate to an upgradable flash BIOS, solving the problems of past board revisions. If they had done these things, the 2940UW Dual would have been the ultimate answer.

boot verdict 8

Price ***$340***
Company ***Adaptec***
Phone ***800.442.7274***
URL ***www.adaptec.com***

Diamond **FirePort 40** Dual

The FirePort 40 Dual is based on Symbios Logic's SYM53C876 single, integrated RISC script UltraSCSI processor. It splits its bus between three 16-bit connectors on the first channel and two 8-bit connectors on the second. The first channel consists of a 50-pin high-density SCSI-2 external connector, a 68-pin high-density SCSI-3 internal connector, and a 50-pin low-density internal connector. The second channel consists of a 68-pin high-density internal connector and a 50-pin low-density internal connector. With five connectors, you can put both wide and narrow devices on both channels (unlike Adaptec's card where the second channel is only on the external connector). This design is well conceived and offers much more versatility than the 2940UW Dual.



We'll take the Diamond card's versatility any day.

Although the 2940UW Dual was faster overall, we'd rather have the FirePort 40's features and connectivity. Complete with a flashable BIOS for firmware revisions and the UltraEasy diagnostic utility for troubleshooting connections and devices, this dual-channel adapter came just shy of a coveted Kick-Ass. If it included bundled RAID software to utilize both channels for hard-core data-pumping action, and two external micro connectors, we'd have given it our highest accolade.

boot verdict 9

Price ***$300***
Company ***Diamond***
Phone ***800.468.5846***
URL ***www.diamondmm.com***

THE TALE OF TWO CARDS

The 2940UW Dual shined when stressed, especially in Win95, where it outperformed the FirePort by more than 1MB/sec. CPU utilization flip-flopped: the 2940UW demanded less under NT, while the FirePort was kinder under Win95. Using Intel's Iometer benchmark, we tested how each card's dual channels handled two physical drives striped into a single NTFS partition. We ran each drive of the FirePort through a separate internal bus connector. For the 2940UW, we daisy-chained each drive off the same internal bus connector. Using both channels garners higher performance, although not as high as expected.

	Adaptec 2940UW Dual	**Diamond FirePort 40 Dual**
TestaCD Labs HD Tach	**Win95 / NT4**	**Win95 / NT4**
Average Read Speed (MB/sec)	16.4 / 16.1	16.3 / 16.1
Average Write Speed (MB/sec)	15.6 / 15.2	15.4 / 15.1
Read Burst Speed (MB/sec)	25.2 / 25.2	24.8 / 26.9
Random Access Time (ms)	8.5 / 8.8	8.6 / 8.8
CPU Utilization	5.7% / 3.9%	5.9% / 3.7%
Single Drive/Single Channel Tests (Win95): Adaptec Threadmark v2.0		
Data Transfer Rate (MB/sec)	9.93	8.66
Average CPU Utilization	29.5%	26.68%
Dual Drive/Dual Channel Tests (NT4): Adaptec Threadmark v2.0		
Data Transfer Rate (MB/sec)	20.27	20.44
Average CPU Utilization	24.75%	34.50%
Dual Drive/Dual Channel Tests (NT4): Intel Iometer		
Drive Throughput (MB/sec)	27.3 (29.2)*	29.1
Average Response Time (ms)	36.6 (34.2)*	34.3
Maximum Response Time (ms)	52.8 (58.4)*	48.7
Average CPU Utilization	2.8% (3.2%)*	4.7%

**The first number is derived from daisy-chaining both physical drives off the same internal bus connector. The number in parentheses is derived from running one drive off an internal bus connector and one drive off an external bus connector. TEST SYSTEM: Micron Millennia Xi with Seagate Cheetah ST39102LW Ultra 2 SCSI hard drive.*

AD INDEX

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Alienware	www.alienware-pc.com	93	81	MediaOn/Artek	www.mediaon.com	C2-1	236
American Power Conversion	www.apcc.com	8	83	Microsoft	www.microsoft.com	22	—
ATI	www.atitech.com	5	85	Midnight Multimedia	www.midnightmm.com	94	244
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Harvest Advertising	www.freeskin.com/horny	94	—	The Xandria Collection	www.xandria.com/bo.htm	94	—
Hercules Computer	www.hercules.com	26	179	World Opponent Network	www.won.net	60	364

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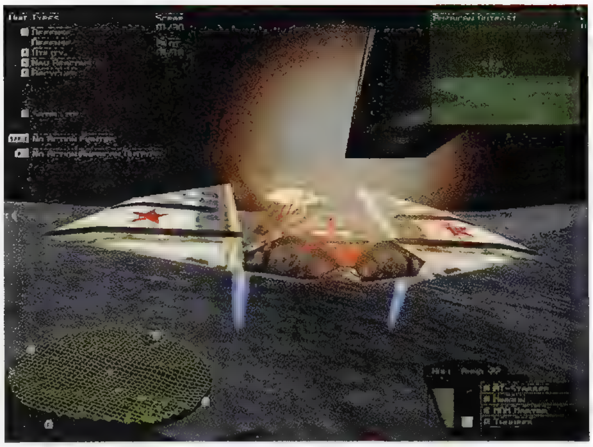
Battlezone

Let loose the hovertanks of war



In a scene from Battlezone, *a Soviet hovertank is about to meet the business end of your turret.*

Battlezone realizes the sweet synergy of first-person action and realtime strategy—and rest assured, Activision's latest resembles the Atari monochrome vector-based arcade machine in name and spirit only.

The solar system is your battlefield as Yanks and Soviets exchange dirty looks and missile salvos over a precious alien metal. You choose sides, gather resources, and make your foes feel the burn.

Two other Activision games are the heart of *Battlezone*. The terrain generator is a highly modified version of the one that drove *Interstate 76*, while AI is borrowed from *Dark Reign*. The texture-mapped polygon landscape generator renders vast lunar surfaces and Venusian planetscapes in maximum 640x480/16-bit glory, with nary the hint of texture seams or repetition. Future patches will open up the vista to 1024x768, and owners of Voodoo^2 will be able to enjoy higher resolution textures, better explosions, and more.

CHECKLIST

Battlezone
Version: 1.0

Max Res/Color 640x480/16-bit

Win95

DirectX
DirectDraw DirectSound
DirectPlay DirectInput

Multiplayer
Modem Direct/serial
TCP/IP IPX

You view the battle from behind the polygon barrel of a hovertank. Visual effects, such as alpha-blended explosions and realtime landscape deformation, fly fast and furious.

For now, performance under the best conditions (P-II 300MHz and faster, dual SLI Voodoo^2) offers locked-in 30fps+. The game is still surprisingly playable on a Pentium 100MHz.

Too bad the multichannel sound effects are on the anemic side.

Gameplay mechanics are based on typical realtime strategy objectives—build and fortify your base, collect and manage resources, and complete the mission objectives. *Battlezone* is easy to grasp, and you'll quickly be building and commanding legions of futuristic war machines to do your bidding. Its tight combination of realtime strategy and first-person action makes it a must for any red-blooded gamer's collection.

—Andrew Sanchez

Price *$50*
Company *Activision*
Phone *310.255.2000*
URL *www.activision.com*

boot verdict 9

M1Tank Platoon II

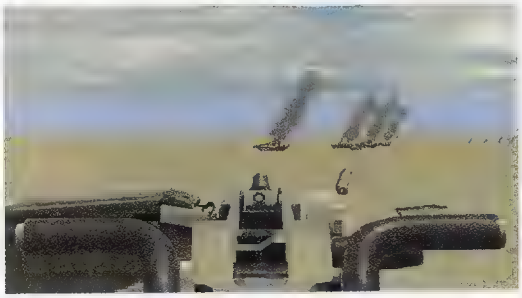
A bugfix away from being the best

M1 Tank Platoon II is programming of such strength and elegance, it approaches art. Reviewers shouldn't traffic lightly in superlatives, but the game really is "the best simulation of ground warfare on the market," or at least it will be once a few minor glitches are resolved.

The game retains the interface of its honored ancestor: scalable strategic map, first-person views from each crew position, highly dynamic campaigns. You can play a satisfying strategic wargame straight from the map or complex tactical games as the platoon CO, or you can just jump behind the gunner's sight and revel in all the bang-bang. Fortunately, the interface allows for smooth transitions between modes, though its complexities can initially be overwhelming.

And oh, what sights you'll see! At its best, *M1TPII* conjures epic vistas. Battlegrounds convey vastness; foliage and buildings are realistic and convincingly 3D; close-ups show minimal pixelation; and the texture-mapped polygon vehicles (93 of 'em) create an impression of immense weight and power. We got about 20fps. The only slow-downs occurred with multiple aircraft on screen, and the brief lurches weren't severe.

Battle scenes are simply awesome.



M1 Tank Platoon II*'s panoramic battle scenes are epic in scale.*

CHECKLIST

M1 Tank Platoon II
Version: 1.1

Max Res/Color 640x480/16-bit

Win95

3D Acceleration
Direct3D 3Dfx Glide

Multiplayer
Modem Direct/serial IPX

Tracers arch at you from a distant tree line. A-10s roar low, their noses bubbling flame. Cluster munitions pepper a hillside like Satan's own fireworks. And the game includes a seemingly infinite variety of fire-and-explosion images.

The campaigns are so creatively designed, no two play out the same. The manual is first-rate, and multiple training missions help you through the steep learning curve.

Had Microprose spent a few more weeks stomping bugs, this would definitely be a Kick-Ass sim. The most irritating flaws include binoculars that don't work, lack of a directional "turret clock" when you're manning the MG, and the thermal viewing mode works only sporadically. The good news is that there's a patch downloadable from Microprose or this month's bootDisc.

—William R. Trotter

Price *$60*
Company *Microprose*
Phone *510.864.4440*
URL *www.microprose.com*

boot verdict 9

BeOS R3 Intel

To Be or not to Be

This was one of the most challenging reviews we've ever encountered. The bootStaff fiercely debated just how to evaluate BeOS. Should we review it as a stand-alone product like any other piece of software? Should we review it as a "machine," benchmarking its performance against Windows 95, NT, or Linux? Do we take into account the lack of third-party applications? And what about the target audience? Be is not touted as a general-purpose OS. It's after a specific niche: high-end audio and video production.

So we decided to review Be as a workstation OS, temporarily forgiving its consumer-software dearth.

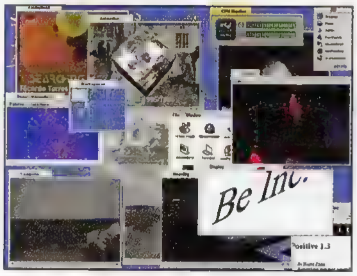
Be installs sweet as honey. Several dual-boot options are included: *Partition Magic*, *LILO*, and a script for the NT boot loader. Hardware support is limited. Matrox and ViRGE videocards are your only sure bet, and just a handful of PCI-based Ethernet boards (all 10BaseT) will link you to the outside world. BeOS does support resolutions up to 4800x3600, should you find a card that goes this high (or run in virtual mode).

As is common with Unix X Window, virtual desktops and workspaces are treated almost as separate screens. BeOS, however, allows for different resolutions and color-depths in each.

BeOS is still in its infancy, and plenty of areas need nurturing. Some sliders increase left to right, while others increase right to left. Pop-up help balloons are absent entirely. Windows are movable by all edges and the tab, but not the menu bar, and are resizable only via the bottom right corner (à la Macintosh). But here's a fresh feature: Right-click on a folder and all its subfolders appear in submenus. This leads to a cool method of moving, copying, and linking files (although your desktop is not a destination option).

So what makes Be a great workstation OS? Let's start with the intrinsic benefits of a protected-memory OS. It's unlikely, if not impossible, that any rambunctious task will crash the system. Also, multithreading makes the OS quick to respond to user actions (multithreading allows a single app to execute multiple tasks concurrently). But actual multimedia demos impressed us the most.

Take the StarChart demo. Using conventional DrawBitmap calls (similar to DirectX-style calls) in which a bitmap is drawn off-screen, then blitted on-screen, we saw an average of 38fps at 100% CPU utilization. By-passing overhead and using Be's BDirectWindow—where the code can access the frame buffers directly—we recorded an astonishing 60fps at 20% CPU utilization. We next pushed our test machine, a dual 300MHz Pentium II, to the brink and achieved an unsurpassed 600fps at 100% CPU utilization. Say it with us: "six hundred frames per second."



Seven streams of video and 16 tracks of digital audio with realtime effects were playing, plus a Mandelbrot fractal generator among other things, before we maxed out the CPUs.

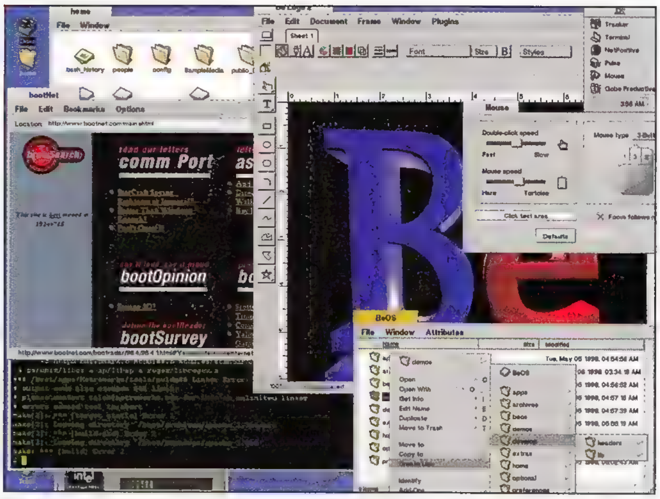
Another impressive demo applied real-time effects to 16 streaming audio tracks, and a few demos showed video manipulation tricks that would make Windows95/NT quickly reveal the Blue Screen of Death. We also saw a demo of virtual book with 30fps video mapped on each page. Flip the page—hell, whip the page—and it turns without a hiccup, its video mapped perfectly to curve of the virtual paper.

Anyone serious about processor-intensive tasks such as audio or video editing should investigate BeOS. A fully configured system can cost a fraction of what the equivalent NT or SGI runs. We give Be developers the thumbs up and hope they can gain some of the respect they deserve—if for no other reason than that they have the cajones to give us another option in the operating system arena.

—*Daevid Vincent*

Price $70
Company Be Inc.
Phone 415.462.4141
URL www.be.com

boot verdict 8



We found ourselves doing the window shuffle more frequently than we cared to, despite having the extra "screens" at our disposal.

[illegible]

You could think of BeOS as a single-user system, although it does have User ID and Group ID built into its micro-kernel. A future release will be multiuser, and most current Be applications are designed with this enhancement in mind. Be's core is POSIX-compliant and Unix-like (though it's not based on any actual Unix code), and follows many Unix conventions and directory structures. Be even runs the popular bash shell as its command-line interface. Be employs most popular Unix commands and a crippled Metrowerks CodeWarrior as its linker. (GNU, however, is available and may have been the wiser choice to bundle.) Web, FTP, and Telnet servers are included along with TCP/IP as the networking protocol.

BeOS is a 32-bit, true preemptive multitasking, pervasive multithreading system (3ms tasks per thread) with an extremely low latency of about 5ms (compare this to Win95's 50ms latency). Symmetric multiprocessing lets you instantly add CPUs to boost performance without the need for rewriting applications. The file system is 64-bit journaling and can accommodate more than a terabyte.

[illegible]

Many of Be's quirks, including the ability to mount FAT32 file systems, are being addressed and will be fixed in a 3.1 patch release. A Developer Program is also in place to expedite the porting of commercial applications, including PowerPC code. Some big-league OEMs—such as Compaq, Gateway, and Umax—view the BeOS as a way to extend their high-end market, and Intel is interested because BeOS shows off what higher-performing, higher-margin Pentium IIs can do (Be only runs on PPC and Intel chips at this time.)

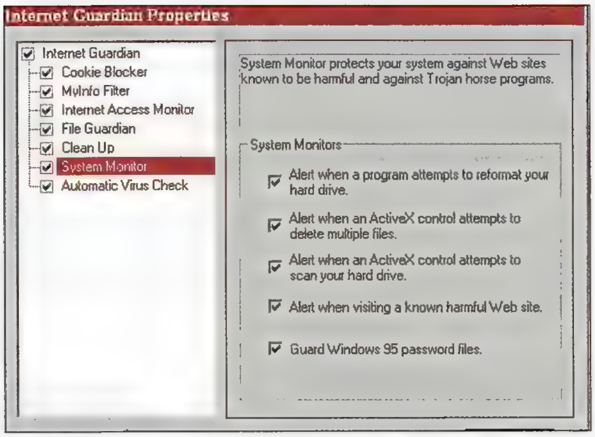
Be says 5,700 developers are currently working on 600 applications for the OS. When we browsed the Be site for graphics programs, we found 63 PPC programs and a paltry 13 x86 applications. Given the Be Intel port is only a month old at the time of this writing, and that CodeWarrior allows for cross-platform compilations, this number will undoubtedly increase.

Utilitopia

Kicking out the riff-raff

The following two utilities provide protection and file-cleaning features to keep your computer running smoothly. But since no utility should be completely trusted to automatically secure or repair everything that ails your OS, we encourage you to compute with extreme caution. Only boot *knows the evil that lurks in the heart of PCs.*

—Sean Downey


Internet Guardian Properties

☑ Internet Guardian
☑ Cookie Blocker
☑ MyInfo Filter
☑ Internet Access Monitor
☑ File Guardian
☑ Clean Up
☑ System Monitor
☑ Automatic Virus Check

System Monitor protects your system against Web sites known to be harmful and against Trojan horse programs.

System Monitors

☑ Alert when a program attempts to reformat your hard drive.

☑ Alert when an ActiveX control attempts to delete multiple files.

☑ Alert when an ActiveX control attempts to scan your hard drive.

☑ Alert when visiting a known harmful Web site.

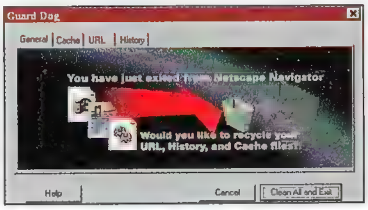
☑ Guard Windows 95 password files.

Guard Dog*'s background monitor can be adjusted from hypersensitive all the way down to mildly impassive.*

Cybermedia **Guard Dog** Deluxe 1.1

TRY IT ON THE DISC

With an easy-to-use system scanner and security monitor, *Guard Dog* promises to sniff out security breeches in your OS and growl at any illicit activity when you're online. It monitors your system for unauthorized net access, to protect you from malicious ActiveX controls and Java applets, adds privacy filters to info submitted to web servers, and blocks access to sensitive files on your hard drive. It also includes an antivirus component that automatically scans downloads and can be used to scan your hard drive manually or automatically.


Guard Dog

You have just exited from Netscape Navigator

Would you like to recycle your URL, History, and Cache files?

Upon exiting your browser, **Guard Dog** *can either selectively or manually delete any trace of your passage across the Internet.*

The Internet controls load at startup. The level of protection can be adjusted from a single screen that provides access to all security options and explains them in messy detail.

Through a background monitor, *Guard Dog* beefs up your browser's security and adds new options to block both direct and indirect cookies, as well as lock out the transfer of information submitted at one site to another site without your knowledge. Another handy option is the Clean Up component, which blows away the cache and history files when you exit your browser.

In our virus test scans, *Guard Dog* missed eight out of 40 viruses and took 8:38 to complete a 2GB hard drive scan—do you really want to surrender your sentry duties to a utility with a success rate of less than 100%? *Guard Dog*'s virus protection lacks the advanced features (such as protected memory program execution) of a full-fledged antivirus utility and was able to clean only four of 32 infected files. We were forced to delete the rest since there's no option to rename or quarantine an infected file.

Our only other complaint about *Guard Dog* is the utility's tendency to hang up our test system whenever shutting down Win95. Apparently this dog doesn't like to come when you call him.

Price $60
Company CyberMedia
Phone 800.721.7824
URL www.cybermedia.com

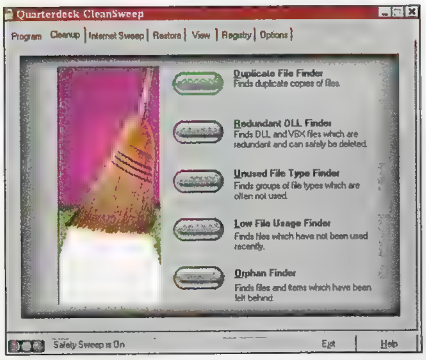
boot verdict 6

QuarterDeck **CleanSweep** 4.0

TRY IT ON THE DISC

Without a doubt, *CleanSweep 4.0* is the most powerful uninstaller you can buy without a prescription. It puts in your hands unprecedented control to decide the fate of each installed program on your Win95 or NT machine. Besides safely removing applications, *CleanSweep* can relocate apps to another hard drive or directory, create backups, archive unused programs, and even copy an installed app and all the necessary links to another PC.

When it's first installed, *CleanSweep* creates a database of file links and registry entries that is continually updated by a background installation monitor. When it's time to remove an app, *CleanSweep* walks you through the removal process by presenting a list of targeted files and registry keys. From here, you can view their contents and modify what goes and what stays.


Quarterdeck CleanSweep

Duplicate File Finder
Finds duplicate copies of files.

Redundant DLL Finder
Finds DLL and VBX files which are redundant and can safely be deleted.

Unused File Type Finder
Finds groups of file types which are often not used.

Low File Usage Finder
Finds files which have not been used recently.

Orphan Finder
Finds files and items which have been left behind.

Safety Sweep is On

CleanSweep*'s Cleanup tab offers many ways to clean the flotsam and jetsam that collects on your hard drive platters.*

The background monitor is both a strength and a weakness. It's smart enough to monitor an installation even after the setup program restarts your system, but takes up a sizable chunk of system memory—up to 7MB—to manage its duties. On our 32MB test system, this resulted in a noticeable slowdown (we have yet to meet an uninstaller in which this isn't the case).

Rounding out the *CleanSweep* package are features that track down orphaned and redundant files and DLLs, eliminate unmatched Registry entries, and keep tabs on infrequently used files that can be removed when more space is needed. *CleanSweep*'s Internet component removes plug-ins and ActiveX controls and selectively cleans cookies and your browser's cache.

CleanSweep puts a lot of power in your hands, but it holds it all in check with its Safety Sweep feature, which blocks the deletion of what it considers essential files. It also creates a backup of everything removed except temp files. Of course, you can turn this off if you really have it in for a particular file.

Price $60
Company Quarterdeck
Phone 800.683.6696
URL www.quarterdeck.com

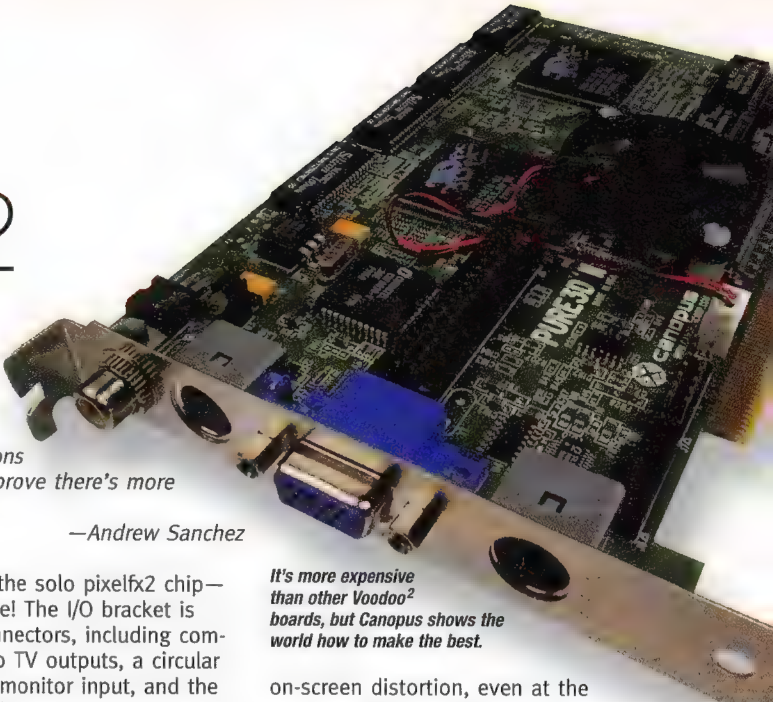
boot verdict 8

VooDeux Part 2

More pixelfx2 madness than you can shake a polygon at

With everybody and their granny whipping up a Voodoo^2 card, how can vendors differentiate their products from the 12MB reference design? Any which way they can, from driver optimizations to a complete redesign of the board itself. The following cards prove there's more than one way to skin a polygon.

—Andrew Sanchez



It's more expensive than other Voodoo^2 boards, but Canopus shows the world how to make the best.

Canopus **Pure 3D** II 12MB

boot KICK ASS! PRODUCT

The Pure 3D II boasts a totally re-engineered formfactor. Despite all the silicon required for a 12MB Voodoo^2 board (4MB on each fx2 chip), Canopus managed to shave a whole inch off the length of the board by tightly packing all the parts on the PCB and moving the RAMDAC to the backside. This means people with AT motherboards needn't worry about the board getting in the way.

The only unfortunate side effect to all this shrinkage is that the SLI header connector migrates down the board a good 2.25 inches. This forces the SLI cable to a six-inch length—twice the length recommended by 3Dfx. If you're a Canopus Total3D 128V owner, an internal analog pass-thru connector (sold separately) spells the end of unsightly outside pass-thru cables. The Chrontel TV decoder chip makes the Pure 3D II the only Voodoo^2 board currently shipping with TV output.

Twelve megs of 100MHz EDO DRAM populate both sides of the board, but the coolest surprise is the board-powered integrated fan on the solo pixelfx2 chip—overclockers rejoice! The I/O bracket is brimming with connectors, including composite and S-Video TV outputs, a circular DIN connector for monitor input, and the typical 15-pin monitor output connector. A green power LED shoots through the composite connector to show whether the board is active. You also get an SLI ribbon cable, and S-Video and composite cables.

Canopus gave the software equal loving care. While the current driver rev didn't include triple buffering as an option, it did include automatic testing of refresh rates, choice of the Pure 3D II as your default 3D device, and more. The bundled Application Launcher allows you to custom-configure individual game configurations, so each app can be tweaked for optimal performance.

During benchmarking, the Pure 3D II was tested at its default 93MHz speed, although we did dabble in a little triple-digit action. Under the knife, the Canopus card ran essentially neck-and-neck with the Monster 3D II, although recent Diamond driver updates did give the Monster an edge here and there. Despite the longer SLI cable, we didn't see any visible on-screen distortion, even at the maximum 120Hz refresh rate.

Nothing says loving like big-screen fragging, and here the Pure 3D II rises above all other Voodoo^2 boards. Whether it's composite or S-Video, the TV display is to die for, with crystal-clear, unwavering output. And yes, 640x480 *Quake II* or *Wing Commander Prophecy* on a TV drops serious bombs. The integrated one-touch screen adjustment is also sweet.

What more can be said? The Canopus Pure 3D II kicks maximum ass.

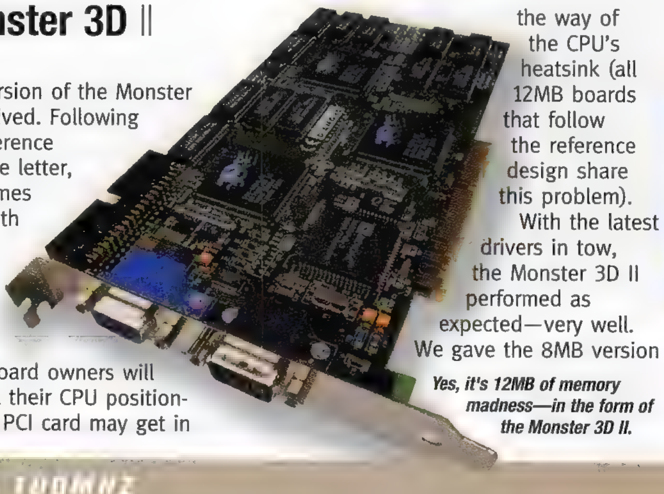
THE STATS Win95 driver: v4.10.01.0098-2.16.1.00.11
THE BUNDLE Win95 drivers | *boot* magazine demo CD

Price $329
Company Canopus Corp.
Phone 888.868.2533
URL www.canopuscorp.com

boot verdict 10

Diamond **Monster 3D** II 12MB

boot KICK ASS! PRODUCT



Yes, it's 12MB of memory madness—in the form of the Monster 3D II.

The 12MB version of the Monster 3D II has arrived. Following the 3Dfx reference design to the letter, the card comes strapped with 12MB of 100MHz Silicon Magic EDO DRAM on both sides of the PCB. Socket 7 AT motherboard owners will need to double-check their CPU positioning, as this extended PCI card may get in the way of the CPU's heatsink (all 12MB boards that follow the reference design share this problem). With the latest drivers in tow, the Monster 3D II performed as expected—very well. We gave the 8MB version a 9/kick-ass, and this card provides even more high-res texture-loving opportunities.

THE STATS Win95 driver: v4.10.01.0200
THE BUNDLE Incoming | Battlezone | Monster Truck Madness 2 | Electronic Arts Sampler CD including: Andretti Racing, Madden NFL 98, Need For Speed II SE, Nuclear Strike, Wing Commander Prophecy

Price $299
Company Diamond Multimedia
Phone 800.468.5846
URL www.diamondmm.com

boot verdict 9

CLOCKING TO 100MHZ

Some Voodoo^2 drivers include sliders that let you clock your 3D card past its default speed limit. Go to ***www.bootnet.com*** *to see how clock levels affect frame rates, as well as learn about cooling strategies for hot silicon.*

GET IT FROM boot Net

STEP BY BENCHMARK

Our benchmark machine is a Micron Pentium II 300MHz armed with an Intel 440LX motherboard and 64MB SDRAM. We use default 3D card settings, with the sole exception of refresh rate, which we adjust as high as possible. This ensures that frame rates are never bottlenecked by the screen redraw ceiling.

But that's it. No tweaks, no tricks. We don't disable sync buffer swaps, nor do we overclock the cards. If a product is sent to us with specific settings, we use them. For Quake and its high-intensity ilk, we let the sounds scream and the network connection work its magic. With these options enabled, you will see lower frame rates compared to other reviews (some reviewers disable every function under the sun). While this may bother people looking for ultimate frame rates, we feel our tests reflect the typical gaming experience filled with bombastic sound effects and all the fixings. After all, how often do you play games with the sound turned off?

Benchmark	Monster 3D II 12MB (single)	Monster 3D II 12MB (SLI)	Pure 3D II 12MB (single)	Pure 3D II 12MB (SLI)	Wicked 3D Voodoo^2 (single)	Wicked 3D Voodoo^2 (SLI)
ForsakenMark (D3D)						
640x480	109.39	114.79	110.03	114.69	109.55	116.1
800x600	58.42	113.04	58.51	112.7	58.59	113.79
1024x768	Can't run	81.37	Can't run	80.9	Can't run	80.48
X (D3D)						
640x480	91.5	95.76	94.53	95.06	91.25	95.31
800x600	81.84	93.5	82.20	93.06	81.88	92.94
1024x768	58.02	72.96	51.44	71.33	58.04	71.25
Turok v1.01 * (D3D)						
640x480	67.3	83.2	68.3	84.7	67.9	84.1
800x600	47.3	75.1	48.2	73.8	47.5	73.6
GLQuake II v3.14 (OpenGL)						
640x480	57.1	66.2	57.7	65.3	56.9	65.1
800x600	43.7	63.1	44.3	61.2	43.7	60.9
1024x768	Can't run	47.5	Can't run	45.5	Can't run	45.2
GLHexen2 (OpenGL)						
640x480	41.9	51.5	41.9	50.1	41.4	49.6
800x600	30.5	46	30	45.4	29.7	45.2
GLQuake (OpenGL)						
640x480	87.9	110.2	88.5	111.1	87.8	110.8
800x600	56.4	97.1	57.1	98	56.5	97
Microsoft D3DTest fill rate						
	48.00Mpixels/sec	96.08Mpixels/sec	48.00Mpixels/sec	96.16Mpixels/sec	48.00Mpixels/sec	96.16Mpixels/sec

** This is a new version (1.01) of the* Turok Dinosaur Hunter *demo. Previous tests were conducted with v1.0 of the demo. Do not compare old frame-rate results with these new scores.*
TEST PARAMETERS: All scores were run three times to ensure a stable score, with the highest scores kept. No special command-line parameters are used—drivers are tested at their default settings. This means sound and all effects are active and running. Refresh rates are set to the highest possible for each resolution: 640x480=120Hz, 800x600=120Hz, 1024x768=80Hz.
Quake II map file=demo2.dm2, Hexen II map file=demo2, Quake map file=bootmark.dem, Turok TMark=all features enabled.

Metabyte **Wicked 3D** Featuring Voodoo^2

boot exclusive

boot KICK ASS! PRODUCT

When Oak Technologies died, Metabyte's WARP 5-powered Wicked 3D (previewed in *boot* 18) became history. The result? Metabyte's Wicked 3D brand switched to 3Dfx technology and announced the Wicked 3D Featuring Voodoo^2.

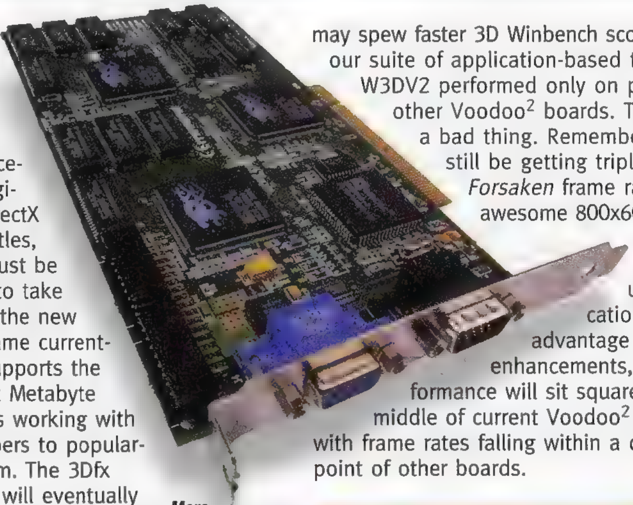
The W3DV2 follows 3Dfx's Voodoo^2 reference design to the letter—no TV-outs or integrated fans to be found. With the obligatory 12MB of EDO DRAM, it looks like the same-old-same-old, right? Wrong! Metabyte's forte is driver optimization, and its engineers have added what they call enhanced transformation and lighting algorithms.

Transformation (vertex manipulation and geometry translation) and lighting (assigning vertex color to simulate realistic lighting effects in the 3D world) occur early in the 3D pipeline and are typically executed by the host CPU. Metabyte says its new driver layer will accelerate these functions, thus freeing up CPU cycles for an overall performance increase.

The enhancements are engineered for DirectX 5.0–specific titles, and games must be programmed to take advantage of the new drivers. No game currently shipping supports the new calls, but Metabyte assures us it's working with game developers to popularize its platform. The 3Dfx miniGL driver will eventually use the transformation and lighting enhancements.

Installation went off without a hitch. Metabyte's drivers include a 90–95MHz overclocking slider and a triple buffer option. We used the 92MHz default setting for benchmarking.

While Metabyte's driver enhancements may spew faster 3D Winbench scores, under our suite of application-based tests, the W3DV2 performed only on par with other Voodoo^2 boards. That's not a bad thing. Remember, you'll still be getting triple-digit *Forsaken* frame rates and awesome 800x600 gaming performance. But until applications take advantage of those enhancements, your performance will sit squarely in the middle of current Voodoo^2 offerings, with frame rates falling within a decimal point of other boards.



More 12MB Voodoo^2 goodness, only this time it's coming from Metabyte.

THE STATS Win95 driver: 4.10.01.0015 **THE BUNDLE** Win95/NT 4 drivers

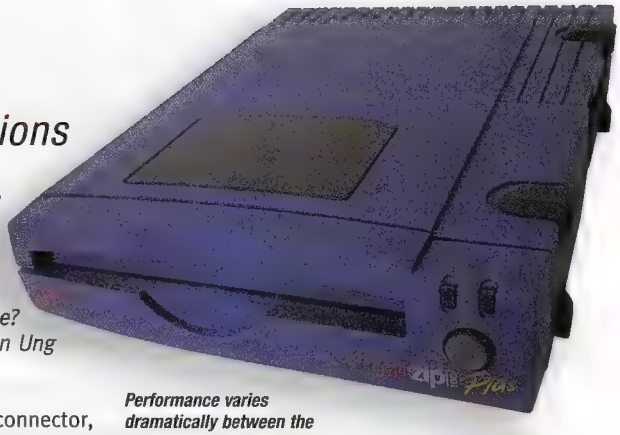
Price $299
Company Metabyte
Phone 510.494.9700
URL www.metabyte.com

boot verdict 9

Zippity-Hoo-Hah

The legacy grows with two new storage options

While PC freaks are scrambling to dump ISA soundcards and 33.6Kbps modems, they're happy to embrace a legacy removable storage device: in this case, the humble Zip. With more than nine million drives floating around computerdom, the 100MB Zip is the reigning champion in a field where ubiquity is the word. It's slower and holds far less than competing drives, but who cares when all you really want to do is sneaker-net a copy of the Troops video to your friend's house? Two new products say the Zip isn't going bye-bye anytime soon. —Gordon Ung



Performance varies dramatically between the parallel and SCSI ports.

Zip **Plus**

Iomega merged its external SCSI and parallel-port models into one unit and upped the price to a painful $200. Although the HD Tach benchmark showed parallel-mode speeds on par with internal IDE Zip performance, actual file transfers told another story.

A 78MB write took 8:10—or six minutes longer than the same amount of data copying over the IDE interface. And if you play an MPEG video from the Zip Plus in parallel mode, you'll get an imitation of streaming video over a 28.8Kbps modem. Iomega says the Plus performs exactly like its parallel-only sibling, but we found a parallel-only unit turned in much uglier times and frame rates. So at least performance over the parallel port has improved.

Plug the Zip Plus into a SCSI connector, and you'll never go parallel again. The Plus played almost every frame of our MPEG video and finished our 78MB file write in 1:47. Still, compare this to the Avatar Shark 250, which moved a 98MB file through a parallel port in just 2:45, and you have to wonder why Iomega couldn't squeeze more speed out of its SCSI mode.

The Plus can only be set as SCSI device 5 or 6, but can auto-detect what kind of port it's plugged into. The only other major improvements are a tiny power supply that doesn't require a big, bulky transformer and an on/off switch integrated into the eject button.

For moving between PC and Macintosh 25-pin SCSI, the Plus is an easy answer. But for those thinking about upgrading to the Plus without going SCSI, forget it—better value and close performance can be found with Iomega's internal IDE drive. While the Plus gives you ultimate versatility, and while the Zip format itself gives you ultimate ubiquity, it comes at a price within striking range of Iomega's fabu 1GB Jaz drive.

boot verdict 7

Price ***$199***
Company ***Iomega***
Phone ***800.697.8833***
URL ***www.iomega.com***

Addonics **Pocket** Zip

Sure bub. You're out to impress someone with your svelte, black, 4-lb. notebook. And then you have to whip out that moldy blue Zip drive and its bulky power supply.

Addonics' new Pocket Zip offers blazing speed, all from a Type I or II PCMCIA port. Unlike the Shark 250, which pulls power from the keyboard port, the Pocket Zip draws power solely from the PCMCIA port. Basically a Zip drive trimmed on all sides, the Pocket Zip opened a can of whup-ass on its Zip cousins. Running on a Pentium 233MHz Micron notebook, the Pocket Zip outran the Zip Plus in SCSI mode on a Pentium II 333MHz. The 78MB write took 1:13—34 seconds faster than Zip Plus SCSI.

The PCMCIA interface runs circles around Zip's parallel mode.

The Pocket Zip also turned in the best seek times and second best average transfer rate according to HD Tach.

Installation went without a snag as our test system recognized the drive as an IDE device with minimal intervention. Drawing less than 3.75 watts, the Pocket Zip sipped at the battery trough.

The Pocket Zip can also draw power from a tiny external power supply (Addonics warns that notebooks that haven't implemented PCMCIA properly may not be able to use the drive because insufficient power is supplied to the slots). The Pocket Zip uses a 16-bit PCMCIA adapter; a 32-bit version will be available later this year.

If you can't get an internal Zip in your notebook, the Pocket Zip is a worthy choice.

boot verdict 9

Price ***$249***
Company ***Addonics Technologies***
Phone ***800.787.8580***
URL ***www.addonics.com***

REAL-WORLD BENCHMARKING

	Addonics Pocket ZIP	*Zip Plus (SCSI Mode)	*Zip Plus (Parallel Mode)	*Zip OEM ATAPI Internal IDE	*Old Zip Parallel
Read 77.8MB of files	1:09	1:14	9:13	1:38	13:34
Write 77.8MB of files	1:13	1:47	8:10	2:11	16:44
View MPEG File					
Frames Played out of 3620	3618	3619	1087	3619	274
Average Frame Rate (24fps max)	23.9	23.9	7.04	23.9	0.97
Read/Seek Times					
Avg. Read KB/s	1106	1147	725	659	585
Seek Time in ms.	46.4	53.6	55	50.8	54.8

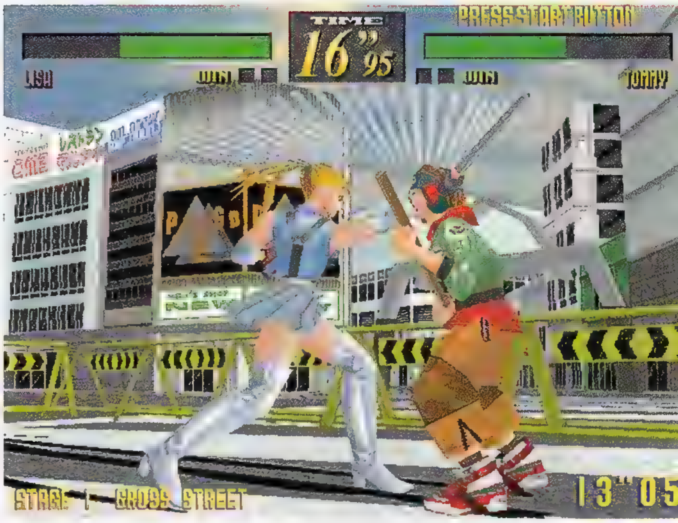
**TEST SYSTEM: NEC SPL 333MHz Pentium II, 32MB SDRAM, Intel AL440LX, SCSI tests with ISA Adaptec AVA-1502E (Zip Zoom SCSI card). TEST NOTEBOOK: Micron XKE 233MHz MMX Pentium with 32MB of EDO RAM.*

Polygon **Pugilists**

When texels tussle

With dual Voodoo^2 in tow, top-of-the-line gaming machines are flexing serious 3D muscle. So why do 3D PC fighting games continue to suck?

—Andrew Sanchez



Tommy's about to taste a bit of wood thanks to Lisa's attack. Too bad software rendering retards her speed.

TRY IT ON THE DISC

Last Bronx

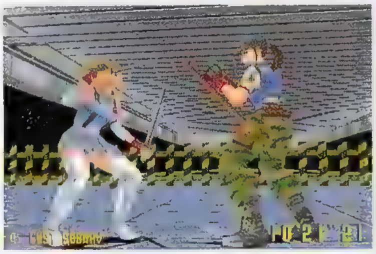
Neo-Japanese gangsters trade tonfa blows and sledgehammer slaps in *Last Bronx,* Sega's latest arcade-to-PC port. Sporting motion-captured, texture-mapped fighters, the arcade game uses Sega's Model 2 board to clock 60fps. This should make the PC version a clincher for hardware acceleration support, right? Wrong.

When will Sega learn? Will they ever acknowledge that most gamers have some type of hardware acceleration? How the hell do they expect us to enjoy 640x480/16-bit action via DirectDraw? *Last Bronx* suffers from all the horrors of an unaccelerated game, including broken perspective correction, low-res textures, and the occasional Z-buffer error resulting in dropped polygons.

While *Last Bronx*'s frame rates were poor, they were noticeably better than those mustered by Sega's *Virtua Fighter 2*, which received a 4 verdict in *boot* 17. Options galore let you interlace the display, lower the res and color depth, and more. We were able to get frame rates into the low 20s by interlacing the visuals and setting the frame-rate adjuster to automatic, but this resulted in jerky movement. Unacceptable. We want smooth, fast frame rates. Sega is promising a Direct3D patch, but considering they promised the same for *Virtua Fighter 2*, and that this little ditty has yet to ship, we aren't holding our breath.

The fighters themselves are exquisitely modeled. Crank up the model detail to high-res, and watch Lisa's miniskirt flow in the wind. Even facial expressions are animated via textures. Sweet.

With optimized software performance, this is Sega's best PC fighting game to date. Too bad that isn't saying much.



Yes, it's our obligatory polygon girlie-fest shot. Get ready to see this and more in **Last Bronx.**

CHECKLIST

Last Bronx
Version: 1.0

Max Res/Color 640x480/16-bit
Win95
DirectX
DirectDraw DirectPlay
DirectInput
Multiplayer
Modem Direct/serial TCP/IP
IPX

Price $50
Company Sega
Phone 800.872.7342
URL www.sega.com

boot verdict 4

TRY IT ON THE DISC

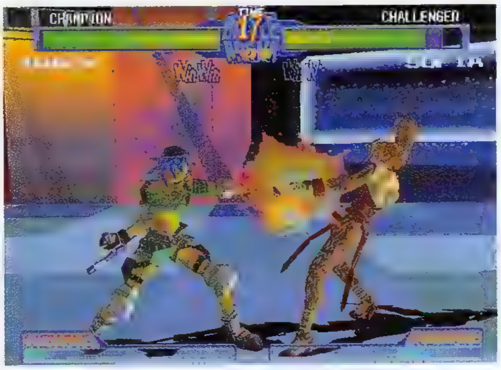
Battle Arena **Toshinden** 2

Farther down the bad fighting game spectrum is *Battle Arena Toshinden 2*, a PlayStation-to-PC port that should have stayed on the console. Continuing the mindless mayhem of the original *Toshinden*, *BAT2* follows fighting-game conventions by throwing even more throwaway fighters in the mix.

Unlike *Last Bronx*, *BAT2* ships with Direct3D out-of-the-box. But when your 3D card is called upon to pamper the texture-mapped polygon fighters, the resulting mess is akin to putting lipstick on a pig. You can try to make it pretty, but it's still a pig.

BAT2's crude PlayStation pedigree shows through with poorly keyframe-animated fighters (heaving polygon chests only go so far), blocky textures, and the worst background artwork we've ever seen in a fighting game. The developers' idea of a rich backdrop is animated texture-mapped walls positioned along the four cardinal points, resulting in fights that look like they're taking place inside a box. Seeing all your favorite *Toshinden* fighters bilinear-filtered, alpha-blended, and running at 30fps+ does warm the heart, but *BAT2*'s atrocious gameplay makes for an instant chill factor. Fighting games live and die by their controls, and jockeying *BAT2* isn't as responsive as *Last Bronx*. We won't even go into the low polygon-count fighters, though gouraud shading and textures do go a long way toward hiding their simple composition.

Avoid *BAT2*—unless you really need to see what Ellis is wearing underneath her dress.



Those wacky fighters are back once again in **Battle Arena Toshinden 2.** *Too bad.*

CHECKLIST

Battle Arena Toshinden 2
Version: 2.0

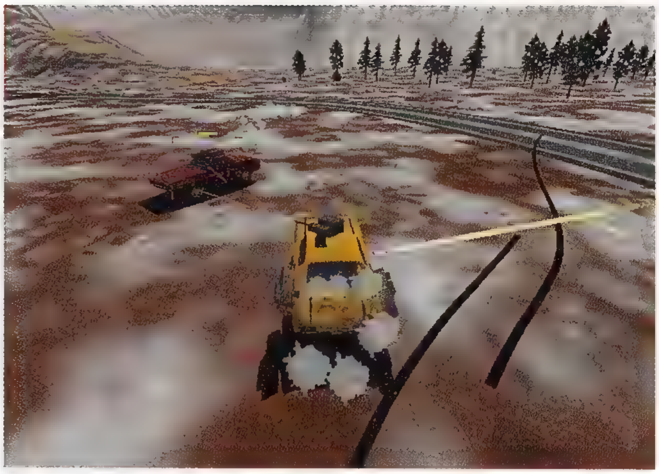
Max Res/Color 640x480/16-bit
Win95
3D Acceleration
Direct3D
DirectX
DirectDraw DirectPlay
DirectInput
Multiplayer
Modem TCP/IP

Price $30
Developer Takara
Publisher Fujitsu Interactive
Phone 888.992.5133
URL www.arcademaster.com

boot verdict 2

Interstate 76 Arsenal

Gettin' funky to the same old beat


Replacing the drab flat-shaded terrain of Interstate 76*'s southwestern setting is colorful new 16-bit terrain such as this mountainous region in the Nitro Pack.*

Interstate 76, Activision's supa-fly vision of 1970s muscle-car mayhem, is back again in an add-on pack. *Arsenal* consists of a refurbished version of the original *I76* and the stand-alone *I76* Nitro Pack—a collection of new missions, multiplayer maps, cars, and weapons. The Nitro Pack missions are uninspiring, but there's still enough meat in *Arsenal* to make it worth a turn behind the wheel.

The original *I76* had all the style and gameplay to drive away with a KickAss award; only a graphics engine full of visual defects, flat-shaded polygons, and low frame rates held it from our highest honor. Hell, it wasn't even hardware-accelerated. *I76 Arsenal* solves the frame-rate problem with native hardware support. On a Rendition V2100, we averaged frame rates in the high 20s. Visual improvements include enhanced 16-bit textures, improved terrain, and a realistically mapped sky, replacing the hideous banding of the original. Unfortunately, visual defects, such as unsightly polygon warping and clipping, are still clunking around under the hood.

The Nitro Pack missions have no unifying story or cut scenes. Each mission lets you play as one of the three original *I76* characters, and a new character is unlocked after all the missions are completed.

The new graphics and difficulty levels make reliving the original a stone-cold groove, but if you've already completed the original and are jonesing for a new pimp ride, the new missions just don't deliver.

—*Sean Downey*

CHECKLIST

Interstate 76 Arsenal
Version: 1.0

Max Res/Color 1024x768/16-bit

Win95

3D Acceleration
Direct3D PowerVR PowerSGL
Rendition Redline 3Dfx Glide

DirectX
DirectDraw DirectSound

Multiplayer
LAN Modem Direct/serial
TCP/IP

Multiple CDs

Specialty Controllers
Force feedback Throttle
Win95 Compatible Rudder

Price *$30*
Company *Activision*
Phone *800.370.9200*
URL *www.activision.com*

boot verdict 7

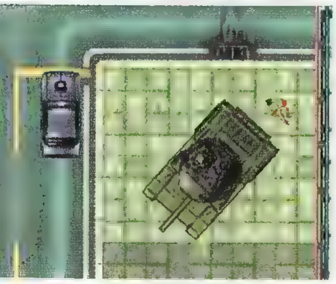
Grand Theft **Auto**

Carjacking for fun and profit

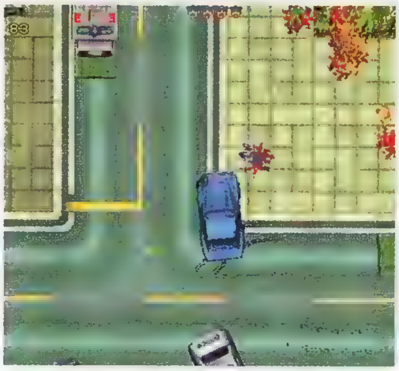
TRY IT ON THE DISC

Grab a car and get ready to run over some innocent bystanders. *Grand Theft Auto*—just banned in Brazil—has arrived in the States. Congress was fretting over *GTA* when it decided to institute RSAC warning stickers on excessively violent games. But what set *GTA* apart from *Carmageddon* are its overhead perspective, AI, and mission-based gameplay.

GTA's texture-mapped buildings are detailed and take advantage of 3Dfx acceleration. Unfortunately, the sprite cars and people are too small to display any real detail. And for the sake of playability, we don't recommend venturing above 640x480 at 16-bit.


Tanks for nothin'. The tank is just one of many vehicles you can tear around town in.

The missions, however, will make any gangster feel warm and fuzzy. In one scenario, you're a drug mule who needs to steal a couple of cars and assassinate one of your boss's enemies.


The overhead perspective takes some getting used to.

GTA's AI is particularly advanced. Pedestrians and automobiles can sense you coming and try to get out of your way. During chases, police run you off the road and pull you over. And as you continue to maraud, the police roadblocks become more difficult to run through. If a cop gets out of his car and starts coming toward you, you can shoot him. And while the officer lies bleeding in the street, you can hijack his car and continue to terrorize the city.

Multiplayer mode doesn't allow play between Windows- and DOS-based gamers, and only the DOS version supports 3Dfx. We also didn't like how difficult it was to navigate around the city. A small paper map is included in the game box, but it's not detailed. Also, you can't save a game until after you've completed a mission.

These are minor grievances given *GTA*'s fun factor. Buy this game before local church groups burn all the copies.

—*Chris DiBona*

CHECKLIST

Grand Theft Auto
Version: 1.0

Max Res/Color 1024x768/24-bit

MS-DOS/Win95

3D Acceleration
3Dfx Glide (DOS only)

DirectX
DirectDraw DirectSound

Multiplayer
LAN Modem Direct/serial
TCP/IP IPX

Specialty Controllers
Gravis Grip Steering Wheel
Win95 Compatible

Price *$50*
Developer *DMA Design*
Publisher *ASC Games*
Phone *888.272.4263*
URL *www.ascgames.com*

boot verdict 7

Software Included on the Boot CD-ROM

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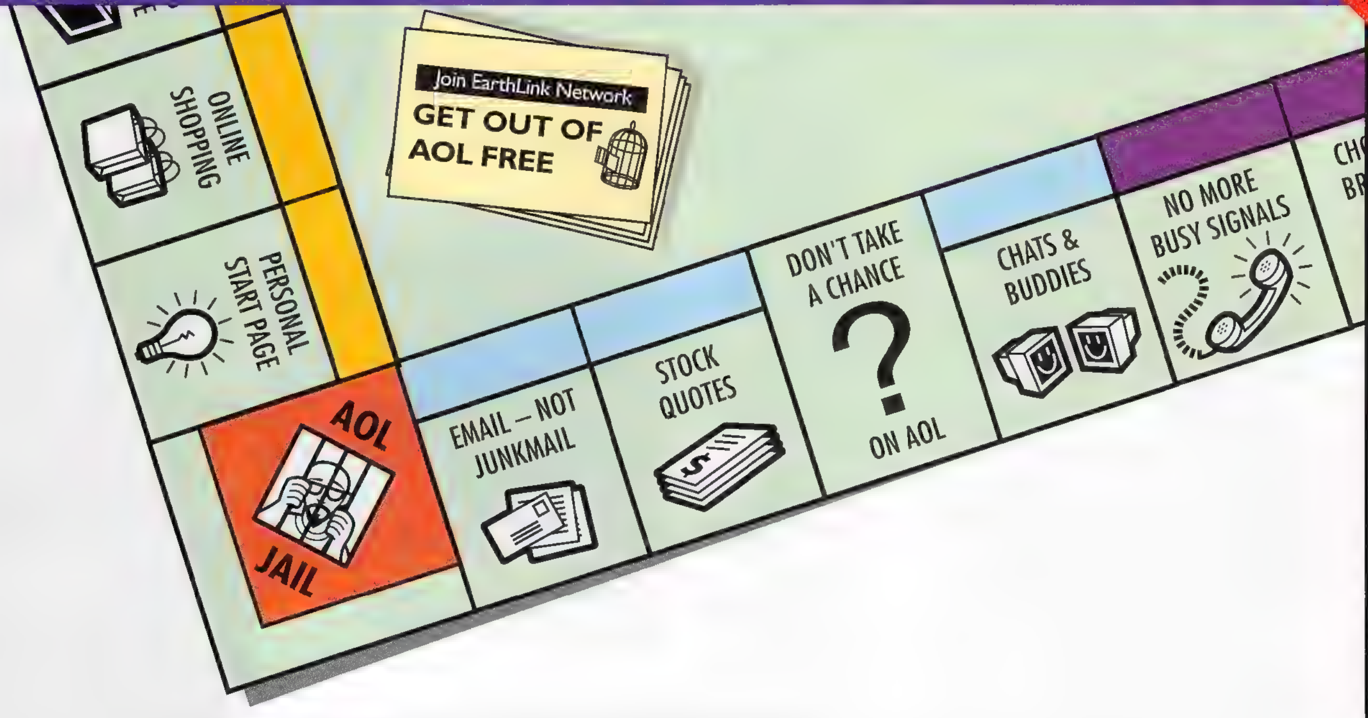

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Eurocom **8500** Notebook

The big, the bad, and the heavy

There's no denying that the Eurocom 8500 is big. It has a big screen—a beefy 15.1—incher. It weighs more than 11 lbs., power brick included. And it's about two inches wider and one inch deeper than other notebooks.

But does that make it any better?

In a word, no.

With a few changes, the 8500 could be kick-ass. But for a notebook billed as the "ultimate computer replacement," the 8500 is missing a few essentials: 3D acceleration, PCI audio, a built-in modem, a network connection, and a gameport. And if we really wanted to be picky, how about a mobile Pentium II instead of an older 266MHz Tillamook?

The 8500 has the makings of a run-of-the-mill notebook, save its massive screen, which, by the way, is a treat indeed. Off-axis viewing is excellent, as is image brightness and sharpness. Even better, the screen exhibited absolutely zero flex when pressed, a testament to the 8500's overall solid construction.

Aside from its sheer size and an extra numeric keypad situated on the far right of the keyboard, the 8500 is distinctive for pretty much nothing else. It doesn't include DVD, and the video subsystem consists of an old standby—Chips and Technologies' 65555 graphics controller. Still, the controller is augmented by 4MB of memory instead of the typical 2MB. The extra memory comes in handy when you want to set the color depth to 24-bit (32-bit color isn't supported at any resolution). The Eurocom also boasts video-in ports and a single S-Video-out.

From a performance perspective, the 8500 managed to snake similarly equipped models, such as Gateway's 266MHz Solo 5100 (reviewed in *boot* 18) and Micron's 233MHz Transport XKE (reviewed in *boot* 17), but not by much. And the Eurocom's so-called high-performing 20x CD-ROM was anything but. During our real-world tests, it was extremely erratic, with slow access times and inconsistent performance. And no matter how hard we tried, we couldn't get it to read gold CDs—at all. To make matters worse, the 8500 ships with the CD-ROM's DMA setting turned off. Yikes.

But the 8500 isn't without good points. The keyboard offers solid tactile response, and the curved speakers—positioned along the hinge assembly—do a good job of pushing audio.

If it's a big screen you're after, it doesn't get any bigger than this. And that extra keypad—which adds additional PgUp, PgDn, and directional keys—can also come in handy for multiplayer games or extended bouts of numerical data entry. But as a bonafide desktop replacement, the 8500 doesn't cut it. If you're looking for a notebook with the latest technologies and a ground-breaking design, look elsewhere. The 8500 is good, but it could be a lot better.

—Bryan Del Rizzo

SPIN CONTROL

The 8500 includes its own heat-seeking missile, a built-in fan that resides on the bottom of the case.

under the hood

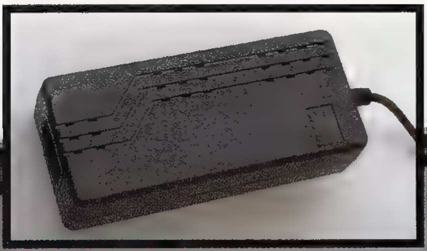
THE BRAINS	
CPU	Intel 266MHz Pentium with MMX
L2 Cache	512K pipeline burst
RAM	64MB SDRAM (expandable to 128MB)
Video	C&T 65555 (4MB EDO DRAM)
THE BRAWN	
Hard Drive	Toshiba Ultra DMA 4GB
CD-ROM	TEAC 20x IDE
Expansion Bus	Two Type II, one Type III, CardBus- and Zoomed-Video-compatible
I/O Ports	Dual PS/2, video-out, S-Video-out, one parallel, one serial, one monitor, port replicator, dual USB
Lap Weight	10 pounds, 2.4 ounces
Carrying Weight	11 pounds, 1 ounce
THE BEAUTY	
Display	15.1-inch active matrix display
Sound	ESS 1879 FM/wavetable synth
Video	1024x768, 24-bit
Speakers	Stereo speakers, 2.0 watts per channel
Communication	Optional 56Kbps PC card modem

REAL-WORLD BATTERY LIFE 02:15:00

THE BUNDLE None

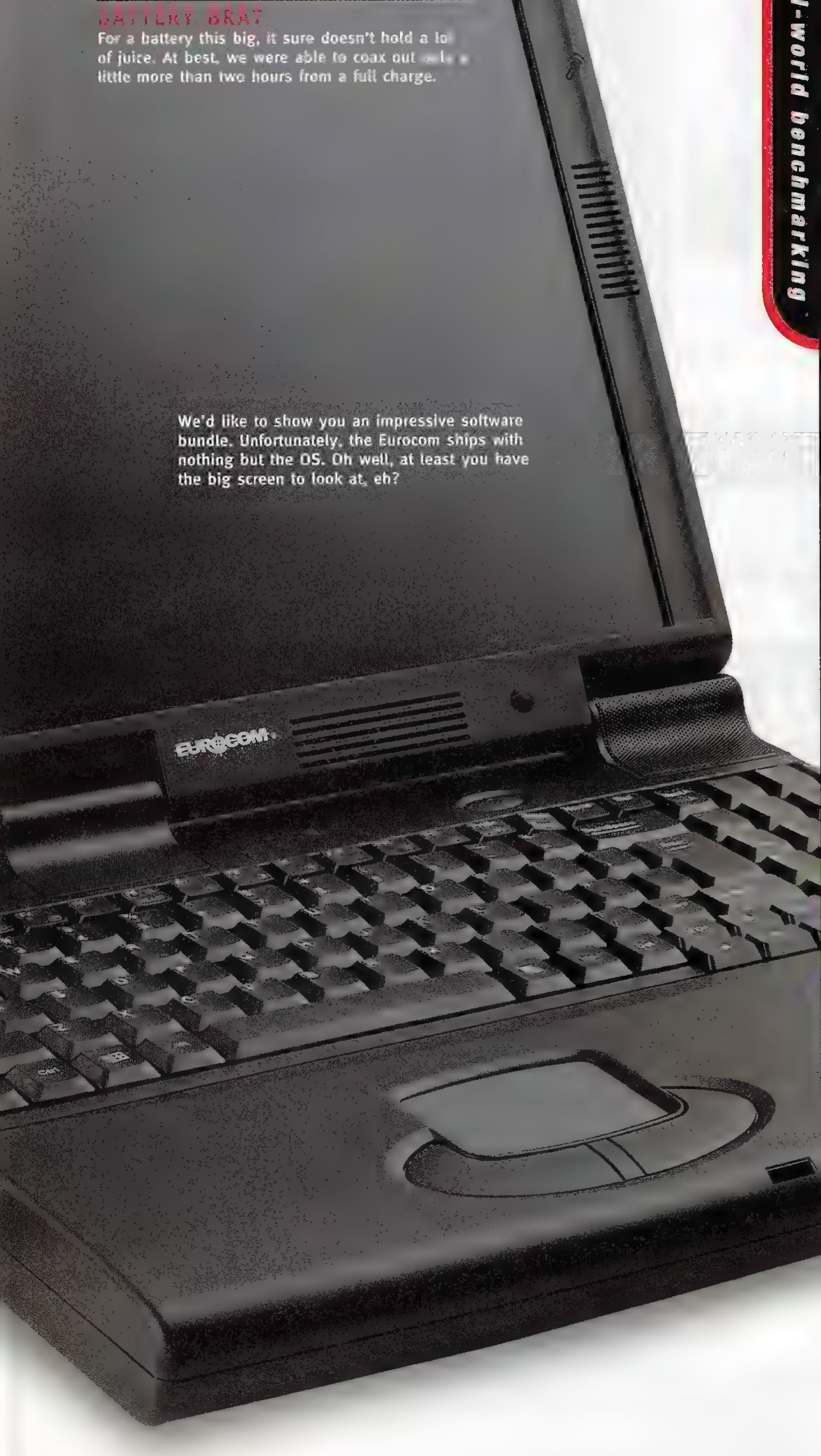
boot 0:25

down 1:50



BATTERY BRAT

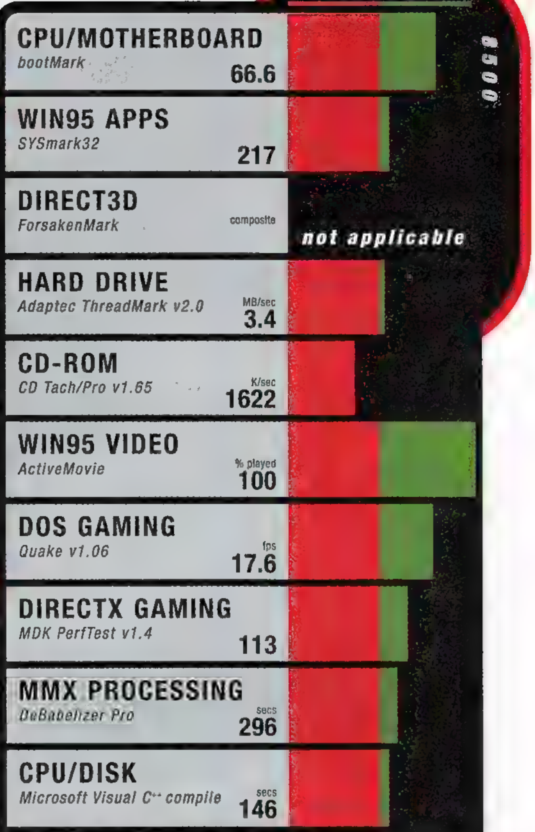
For a battery this big, it sure doesn't hold a lot of juice. At best, we were able to coax out only a little more than two hours from a full charge.



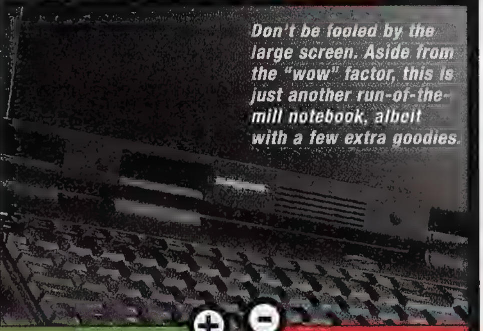
We'd like to show you an impressive software bundle. Unfortunately, the Eurocom ships with nothing but the OS. Oh well, at least you have the big screen to look at, eh?

Eurocom 8500

real-world benchmarking



CPU/MOTHERBOARD	*bootMark*		66.6
WIN95 APPS	*SYSmark32*		217
DIRECT3D	*ForsakenMark*	composite	*not applicable*
HARD DRIVE	*Adaptec ThreadMark v2.0*	MB/sec	3.4
CD-ROM	*CD Tach/Pro v1.65*	K/sec	1622
WIN95 VIDEO	*ActiveMovie*	% played	100
DOS GAMING	*Quake v1.06*	fps	17.6
DIRECTX GAMING	*MDK PerfTest v1.4*		113
MMX PROCESSING	*DeBabelizer Pro*	secs	296
CPU/DISK	*Microsoft Visual C++ compile*	secs	146



Don't be fooled by the large screen. Aside from the "wow" factor, this is just another run-of-the-mill notebook, albeit with a few extra goodies.

+	−
15.1-inch screen	Heavy like a rock
Numeric keypad	Middling performance
TV-out and S-Video-out	Flaky CD-ROM
[illegible]	ISA-based audio

Price $4,678
Company Eurocom
Phone 888.339.0795
URL www.eurocom.com

boot verdict 7

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

UPGRADE THIS

Eurocom offers a variety of upgrade options, including an internal Zip drive ($281), a 56Kbps modem ($211), and a SuperDisk/LS-120 ($237). Both the Zip drive and the LS-120 can be swapped out with the floppy drive, which can also be replaced with an additional hard drive.

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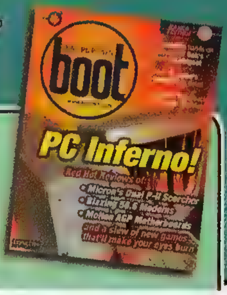
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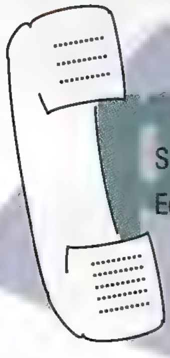

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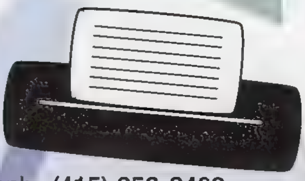

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-COMPUTER GAMING WORLD, July, 1998

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Diamond Monster Voodoo II w/8MB
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Hercules Terminator 2X/i w/8MB
Intel i740 Chipset 2X AGP
Dual-Diamond Monster Voodoo II's
24MB Scan-Line Interleave Mode
11.5GB Ultra-DMA Hard Drive
Iomega Internal Zip Drive 100MB
SoundBlaster 16 PnP
Diamond Monster Sound MX200
Altec Lansing ACS500 Dolby Pro-Logic
Subwoofer & Speaker System
Hitachi 2nd Generation DVD Player
ATX Full-Tower Case w/300 Watt
Power Supply w/Dual-Fans
KoolMaxx Video Cooling System
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Asus P2B-98-S, 100 MHz. bus, Ultra-2 SCSI	$325
DFI-BX, 100 MHz. bus, Single CPU, ATX	$161

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DFI-TX, Intel TX, 4 PCI, 3 ISA, 4 simm, 2 dimm	$85
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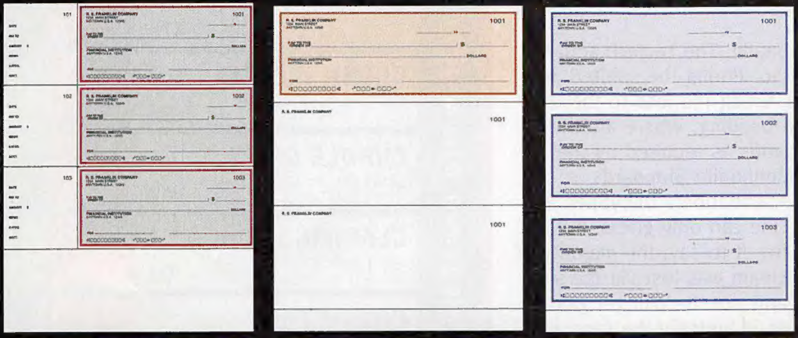

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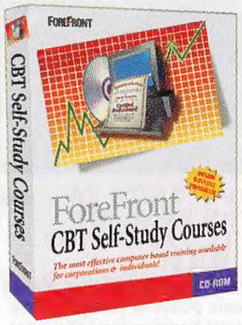
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Product Information Number 13

Lactech **ButterBuster** 1880

Cream Machine 98

This most AmishWorthy of butterchurns beckons a new era of cream-processing science. Simply put, you won't find a faster coagulation engine this side of Lancaster, PA. Dig the butterMark score of 67. That's 35 minutes faster than the DairyPrince 220! You can thank the ButterBuster's almost nonexistent plunger differential, as well as the churn's patented GodSpeed technology, which uses staggered angled leafing on the inside of each slat to increase the convection rate by up to 45%. That makes for butter thicker than thick—it's thickerer.

Performance aside, the 1880 is loaded with thoughtful options. The plunger has an internal lock that prevents it from flying up and hitting you in the face should a witch put a motion-hex on it. And for redundant safety, the beautiful oak woodwork is coated with a spell-resistant veneer. Nice.

Still, the ButterBuster is not without its sins. Cream loss troubled us. Our burly human benchmark, Abraham Lapp, he of the sinewy forearms, schooled the ButterBuster with an hour's worth of honest, hard-working, high-speed churning. No lollygaging, no breaks for lemonade. The Lactech squandered 35cc during the spirited jam session. Credit the loss to the retro wooden banding. Where are the metal bands as required by the Mennonite Standards Association's DairySpec 98? One can only guess, but suffice it to say, the majority of cream was lost via the slats and *not* the plunger gasket, as is typically the case with BTX formfactor churns.

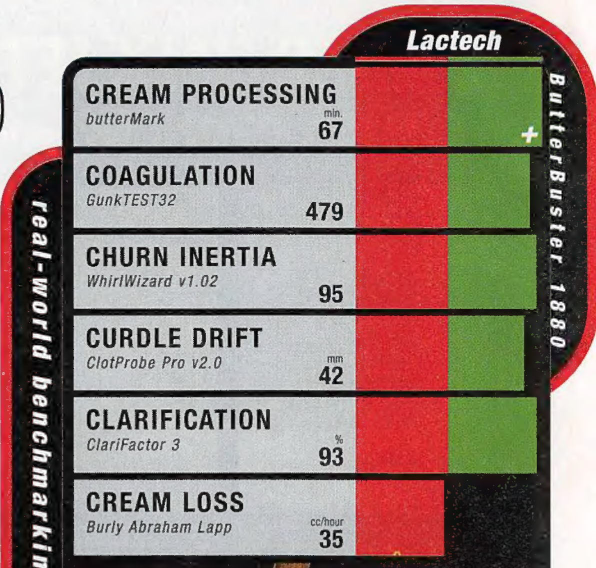
But whatcha gonna do? The 1880 holds eight gallons of cream and coughed up the sweetest butter we've ever spread on a farmer's muffin. Mmm, mmm, mmm. We'd have sworn we'd died and gone to heaven.

APOLOGIZE TO THE LADY, OR I'LL SMACK YOU, I WILL!
Doh! Wooden banding! Maybe some nouveau funky-monkey metal banding would've kept this churn cream-tight.

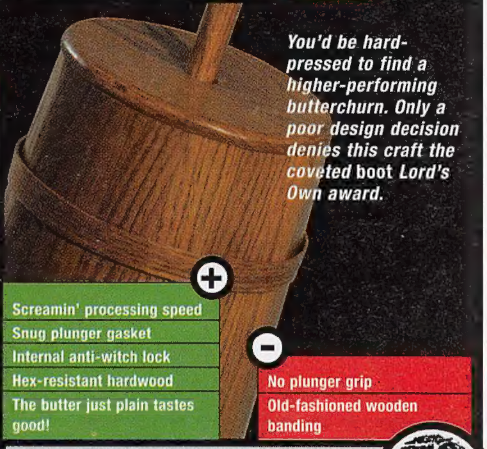
WHAT SKILLS HAVE YOU, JOHN BOOK?
Take a peek down that plunger hole. See any cream? That's right, you can't see a thing. Because the plunger differential is locked in at 2.2mm. Praise be.

WASTE KNOT, WANT KNOT
The ButterBuster's sole slat knot is found on the rear panel. The Mennonite Standards Association rates it to remain cream-tight for 48 months or 700 batches of butter, whatever comes first.

real-world benchmarking



Benchmark	Test	Unit	Score
CREAM PROCESSING	butterMark	min.	67
COAGULATION	GunkTEST32		479
CHURN INERTIA	WhirlWizard v1.02		95
CURDLE DRIFT	ClotProbe Pro v2.0	mm	42
CLARIFICATION	ClariFactor 3	%	93
CREAM LOSS	Burly Abraham Lapp	cc/hour	35



You'd be hard-pressed to find a higher-performing butterchurn. Only a poor design decision denies this craft the coveted boot Lord's Own award.

+
- Screamin' processing speed
- Snug plunger gasket
- Internal anti-witch lock
- Hex-resistant hardwood
- The butter just plain tastes good!

−
- No plunger grip
- Old-fashioned wooden banding

Price *one lamb and a bag of turnips*
Company *Lactech*
Phone *N/A*
URL *Bah! The Internet is an agent of Satan!*

boot verdict 9

A complete explanation of benchmarks is available on a historical quilt located in the *boot* hope chest.

under the wood

THE BRAINS		
Plunger	36-inch Lactech StickKing 3000	
Plunger gasket	Lactech PG6300 w/dovetail interleave and redundant rivets; 2.2mm plunger differential	
THE BRAWN		
Slatting/ churn design	16 1x2x21-inch Schaeffer and Sons hardwood slats; 8-gallon BTX formfactor with patented GodSpeed technology; nonexpandable	
Banding	Two 3/4-inch tempered wood rings from the shop of John Schlitz	
Base	8-inch diameter hardwood base found somewhere in the barn (finder's keepers)	
THE BEAUTY		
Veneer	Witch-Away Light Brown Miracle Seal	

EXPANSION MAP

AGP	Empty
PCI	Empty
ISA	Empty

THE BUNDLE 28 oz. 100% Holstein cream | Microsoft MilkMaid 98

fill-up	*scoop-out*
1:45	45:03

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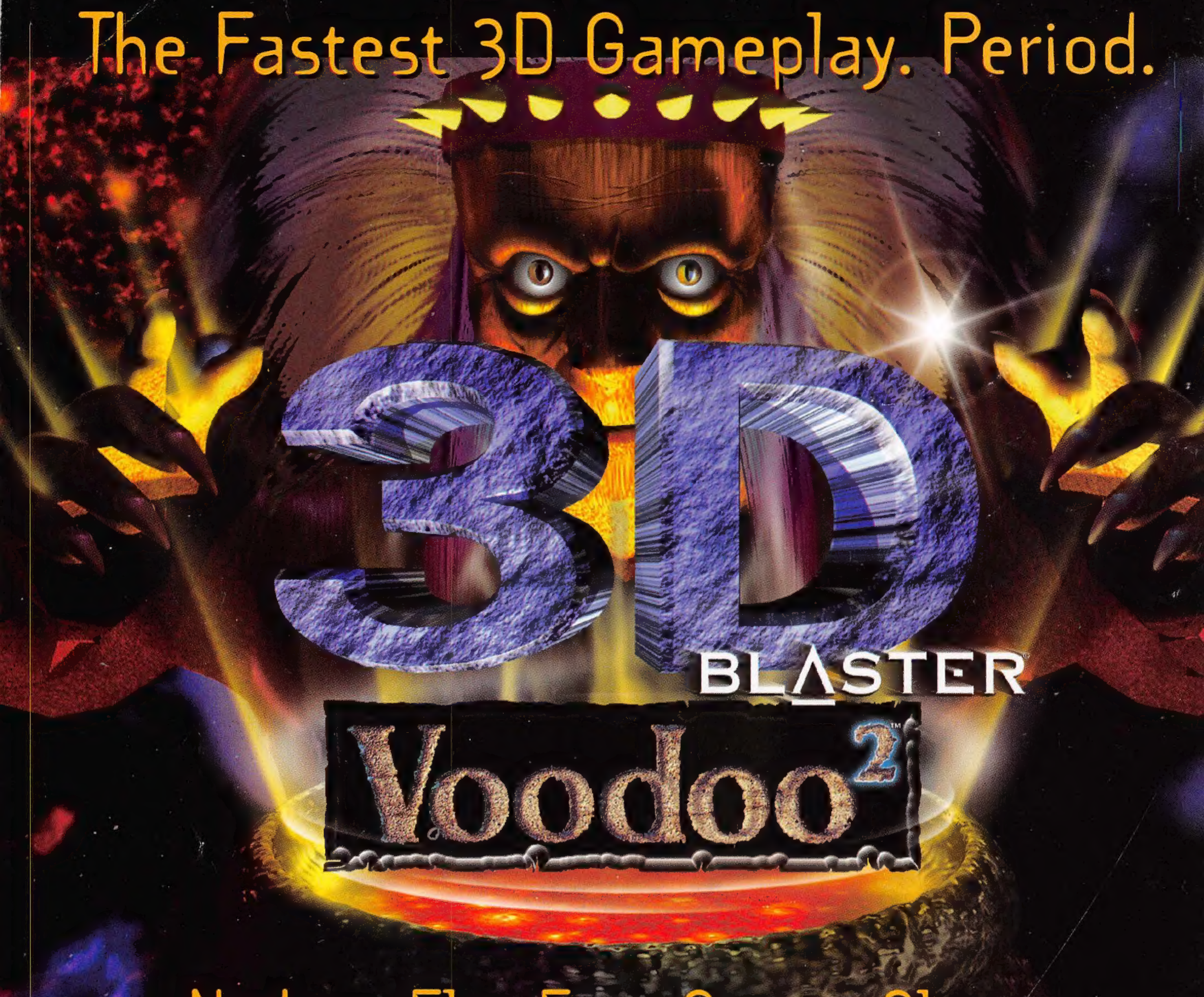
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